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THE EFFECTS OF ENTREPRENEURSHIP EDUCATION ON INDIVIDUALS' COGNITIVE PROCESSES AND LEARNING OUTCOMES: A GENDER PERSPECTIVE

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INTRODUCTION

Entrepreneurship Education at universities, defined as the set of education offerings aimed at preparing individuals to identify and act upon value-creating opportunities (Fayolle, 2013; Lackéus, 2015; Nabi et al., 2017), occupies a central role in the academic debate and university practice (Eesley & Lee, 2021) for its multitude of benefits on individuals' competencies and career prospects, as well on society where it stimulates economic growth and fosters innovation (Lackéus, 2015; Martin et al., 2013; Nabi et al., 2017). Within the Entrepreneurial University – defined as an institution with a strong emphasis on fostering entrepreneurship, innovation, and commercialization of high-quality research and knowledge (Guerrero et al., 2016; Guerrero and Urbano, 2020) – Entrepreneurship Education plays a pivotal role: it actively prompts and supports entrepreneurial endeavors, contributing to increasing the rate of entrepreneurs that, in turn, stimulates economic growth (Rauch & Hulsink, 2015); it fosters innovation and nurtures individuals endowed with key competencies relevant in various aspects of life and not only useful to start new ventures (Lackéus, 2015; Nabi et al., 2017). Hence, Entrepreneurship Education is a fundamental mission within the Entrepreneurial University (Guerrero et al., 2016; Guerrero and Urbano, 2020), fostering a culture of entrepreneurship, innovation, and the development of versatile competencies that benefit individuals and society as a whole (Lackéus, 2015). As a consequence, Entrepreneurship Education courses and interventions have grown rapidly within and across universities (Duval-Couetil, 2013; Nabi et al., 2017), and also scholarly community has acknowledged their impact on a range of learning outcomes and cognitive processes (Carpenter & Wilson, 2022; Longva & Foss, 2018; Martin et al., 2013; Martínez-Gregorio et al., 2021; Nabi et al., 2017; Rideout & Gray, 2013).

However, previous impact studies aimed at understanding the effects of Entrepreneurship Education find contradictory results suggesting also negative among prevailing positive outcomes (Bae et al., 2014; Dickson et al., 2008; Martin et al., 2013; Nabi et al., 2017; Rideout & Gray, 2013); particularly, as recommended by Nabi et al. (2017), it is urgent to explore the causes of these contradictory findings by questioning how contextual reasons, such as pedagogies adopted and contents taught in

Entrepreneurship Education classrooms, as well as individuals' socio-demographic characteristics of the audiences, play a role as contingencies.

To do so, this dissertation focuses specifically on Entrepreneurship Education teaching models distinguishing between theory-oriented and practice-oriented pedagogies, different contents taught within Entrepreneurship Education courses and interventions, and to provide evidence regarding the adequacy between methods and contents adopted and audience specificities (Fayolle, 2013), this dissertation focuses on gender as main individuals' socio-demographic characteristic that plays a role as contingency.

This dissertation contributes to such advancement by addressing the following research questions: "How does Entrepreneurship Education, and particularly its contents and the teaching models, affect individuals' learning outcomes and cognitive processes? How do individual socio-demographic characteristics, and particularly gender, intertwin with such dynamics?". Literature on Entrepreneurship Education highlights differences in how individuals, especially men and women, achieve key outcomes (Padilla-Angulo et al., 2021, 2022; Shinnar et al., 2012, 2014, 2018), including entrepreneurial learning outcomes such as entrepreneurial knowledge, skills, and abilities, as well as entrepreneurial intentions, and consequent behaviors. Overall, past research underlines that there exists a tendency for women to benefit less from Entrepreneurship Education with respect to their male counterparts (Shinnar et al., 2012, 2014, 2018; Westhead & Solesvik, 2016; Wilson et al., 2007); yet, literature remains silent on the causes of such differences.

Thus, the main objective of the dissertation is to develop empirical research aimed at understanding the processes and antecedents, as well as the mechanisms and the contingencies that lead not only to the consequent entrepreneurial behaviors of women but also help understanding how women can benefit from Entrepreneurship Education.

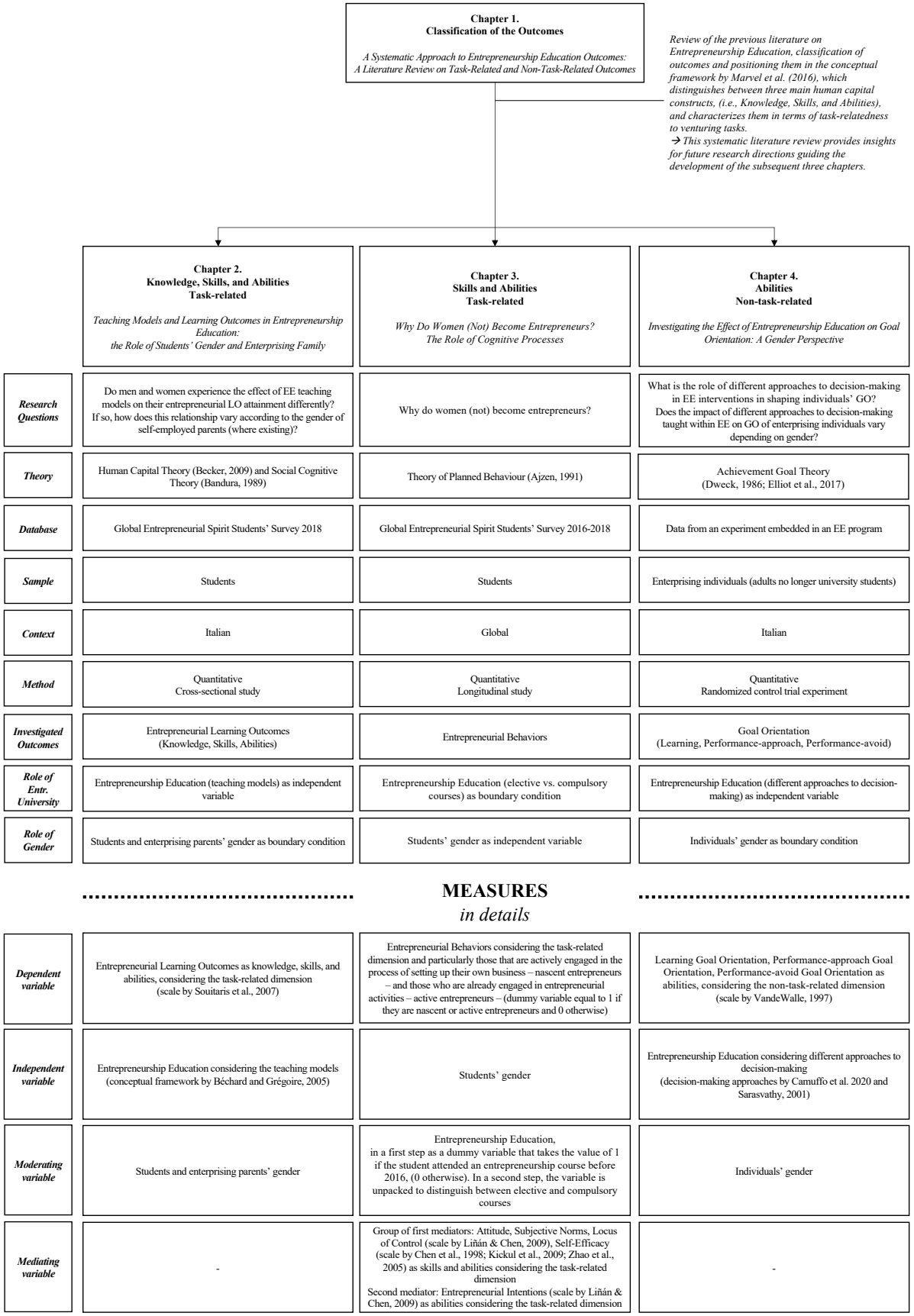
Accordingly, the dissertation focuses on individuals, who followed Entrepreneurship Education courses and interventions, as focal actors; these are not only students involved in higher education but also adults (i.e., enterprising individuals *no longer university students*) trained by the University.

The articles of this dissertation draw on established theories within entrepreneurship research and it predominantly employs a quantitative methodology, where hypotheses are tested on survey-based samples.

The first article (Chapter 1) aims to create a comprehensive classification of outcomes stemming from Entrepreneurship Education and relying on Human Capital Theory in entrepreneurship research (Marvel et al., 2016). This article introduces an innovative dimension to Entrepreneurship Education debate by introducing the concept of non-task-related outcomes, which refers to *"types of human capital that do not directly relate to venture tasks"* (Marvel et al., 2016, p. 608). This article systematically reviews 23 years of previous literature on Entrepreneurship Education impact studies: particularly empirical articles that show the impact of Entrepreneurship Education on a range of different outcomes have been included in the systematic literature review, for a total of 160 empirical studies published in ABS ranked journals. This exhaustive review maps out a wide spectrum of outcomes (143 outcomes in total) that have been reported as results of participating to Entrepreneurship Education courses and interventions. This study reveals that previous literature on Entrepreneurship Education impact studies mostly focused on outcomes associated with venture tasks (i.e., task-related outcomes) such as entrepreneurial intentions and behaviors (Alakaleek et al., 2023; Gielnik et al., 2015; Shinnar et al., 2018; Souitaris et al., 2007), entrepreneurial performances (Chen & Agrawal, 2018; Eesley & Lee, 2021; Huber et al., 2020), entrepreneurial knowledge, skills, and abilities, (Alakaleek et al., 2023; Bergman et al., 2011; Cadenas et al., 2020; Debarliev et al., 2022; Díaz-Casero et al., 2012; Souitaris et al., 2007), overlooking the non-task-related dimension such as general knowledge, skills, and abilities not directly related to venture tasks. Furthermore, the chapter provides insights for future research directions, thereby guiding the development of the subsequent empirical and quantitative articles in this dissertation.

Figure 1 provides a holistic view and summary of the subsequent chapters: the elements highlighted in Figure 1, such as research questions, investigated outcomes and their task-relatedness to venture tasks, tested main theories, sample characteristics, and variable details, collectively contribute to provide a comprehensive overview of the dissertation structure and contents.

Figure 1. Overview of dissertation chapters.



A literature gap identified in the first article (Chapter 1) aligns with a prior call for research made by Nabi et al. (2017), emphasizing the necessity for further empirical investigations into how different teaching models of Entrepreneurship Education affect entrepreneurial learning outcomes, that is entrepreneurial knowledge, skills, and abilities (Johannisson, 1991; Souitaris et al., 2007). Therefore, the second article (Chapter 2) presented in this dissertation seeks to address this gap by delving into how different teaching models (independent variables) have the potential to produce different impacts depending on individuals' socio-demographic characteristics and social contexts. Specifically, the teaching models investigated are classified based on the conceptual framework by Béchard and Grégoire (2005) that distinguish between (i) Supply Model, which is the most theory-oriented teaching model based on frontal lectures, (ii) Demand, which is based on classroom experiences and participative methods through exploration, simulation, discussion, and experimentation, (iii) Competence, which is the most practice-oriented teaching model based on tackling real-world problems and opportunities, and two hybrid models (iv) Supply-Demand Model and (v) Demand-Competence Model which represent a mixture of the above.

The outcomes investigated are the entrepreneurial learning outcomes (dependent variable) that are knowledge, skills, and abilities individuals need for the venture creation task (i.e., task-related outcomes). Thus, this article contributes significantly by exploring how individuals' gender and the gender of their self-employed parents (moderating variables) influence the relationship between Entrepreneurship Education teaching models and entrepreneurial learning outcomes. To do so, this chapter employs a sample of students that answered the Italian GUESSS 2018 (Global Entrepreneurial Spirit Students' Survey).

Another major literature gap that emerged from the systematic literature review regards the transition from entrepreneurial intentions into actual entrepreneurial behaviors. Since Entrepreneurship Education can not only be a trigger of cognitive processes (Duong, 2022; Fayolle & Gailly, 2015; Souitaris et al., 2007; Varamäki et al., 2015), but can also be a contingency (Bischoff et al., 2020; Entrialgo & Iglesias, 2016; Oosterbeek et al., 2010), in the third article of the dissertation (Chapter 3) the gender-entrepreneurial behaviors relationship is the case in point to examine the contingent role of Entrepreneurship Education. Thus, this article aims to conduct a comprehensive

examination of the transition from entrepreneurial intentions into actual entrepreneurial behaviors, starting from a full testing of the Theory of Planned Behavior (Ajzen, 1991), through a double serial mediation model: notably, it proposes that being a woman (independent variable) affects entrepreneurial behaviors (dependent variable) and that this relationship is double serially mediated four cognitive factors – that are attitude toward the entrepreneurial behavior, subjective norms, entrepreneurial self-efficacy and locus of control – and entrepreneurial intentions (mediating variables). Here, entrepreneurial behaviors are considered within the task-related dimension, specifically focusing on individuals actively involved in the process of setting up their businesses (i.e., nascent entrepreneurs) and those who are already engaged in entrepreneurial activities (i.e., active entrepreneurs). In addition, the paper considers the role of Entrepreneurship Education, considering elective vs. compulsory courses, as a contingency (i.e., moderating variable) and how it helps narrow these differences.

To do so, this chapter employs the global and longitudinal GUESSS database (GUESSS 2016 - GUESSS 2018).

A further notable literature gap that has emerged from the literature pertains to the exploration of potential non-task-related outcomes stemming from Entrepreneurship Education. Through a randomized control trial experiment, the fourth and last article (Chapter 4) aims to understand how Entrepreneurship Education (independent variable), and particularly different types of interventions such as those aimed at teaching individuals new approaches to decision-making (i.e., Scientific Approach and Effectuation Approach), influences goal orientation (dependent variable) in enterprising individuals (i.e., individuals *no longer university students)*. Goal orientation is defined as individuals' predisposition or situational goal preferences in achievement settings (Dweck, 1986; Dweck et al., 1988; Payne et al., 2007; VandeWalle, 1997) and conceptualized in a trichotomous model (VandeWalle, 1997), respectively learning goal orientation, performance-approach goal orientation, and performance-avoid goal orientation. Notably, goal orientation represents a motivational state that can be shaped through educational interventions (Dweck et al., 1988). In addition, since goal orientation is valuable across a broad spectrum of fields and contexts (Payne et al., 2007), it can provide valuable insights into the development of successful strategies and interventions that foster success and growth in various domains of life. Then, by examining the gender

dimension (moderating variable), the study aims to understand potential differences between men and women in how they benefit from Entrepreneurship Education, shedding light on how different types of interventions impact their goal orientation differently.

Taken together, these studies offer four main contributions.

First, the dissertation emphasizes the central role of Entrepreneurship Education at university in academic debates and university practices; it highlights how such education not only benefits individuals by enhancing their competencies and career prospects but also contributes to society by stimulating economic growth and fostering innovation; it reinforces the idea that Entrepreneurship Education is a fundamental mission within the Entrepreneurial University (i.e., teaching mission) (Guerrero et al., 2016; Guerrero and Urbano, 2020) emphasizing the role of the university in fostering a culture of entrepreneurship, innovation, and knowledge commercialization. Particularly, the dissertation enables a deeper and more nuanced understanding of the types of outcomes and processes of Entrepreneurship Education.

Second, as an important form of contingency analysis, the dissertation offers a gender view in all the empirical chapters which allows us to better understand the underlying processes from a theoretical point of view; it identifies the gender gap as a critical issue shedding light on factors that (do not) encourage women to undertake entrepreneurial careers; it also seeks to explore how the contents and teaching models employed in Entrepreneurship Education interventions can impact the cognitive processes and learning outcomes of both men and women; and yields recommendations for Entrepreneurship Education programs that not only can encourage women to engage more in entrepreneurship and provide them with the competencies useful to achieve success in the entrepreneurial field, but it also seeks to explore the best practices to use in Entrepreneurship Education interventions to try to reach women more effectively.

Third, it highlights the importance of teaching models implemented and the contents taught within Entrepreneurship Education courses and interventions, in order to study their impacts on outcomes. Indeed, this dissertation highlights that pedagogical and teaching models, as well as contents taught during Entrepreneurship Education classrooms, exhibit differences in their impact on individuals. Since pedagogical approaches matter when studying Entrepreneurship Education impact, a deeper debate on what is done in the classroom and why it is done is needed.

Fourth, it advocates for the inclusion of various target groups and different types of audience, not limited to university students, considering the importance of providing Entrepreneurship Education at university to individuals including those who are no longer university students but potential, nascent, or practicing entrepreneurs.

Then, the dissertation provides practical contributions by emphasizing the importance for course designers and instructors to thoroughly examine the demands, needs, and characteristics of their audience. A tailored approach is crucial for adapting teaching methods to diverse learning preferences and requirements, particularly among women. Furthermore, the dissertation extends the conventional measures of Entrepreneurship Education effectiveness by shedding light on the impact of Entrepreneurship Education on non-task-related outcomes, such as motivation and achievement in various life domains. This suggests that Entrepreneurship Education has the potential to deliver broader benefits to individuals, extending beyond entrepreneurship, but also can become a more inclusive and impactful tool for individuals, particularly women, looking to underpin entrepreneurial careers as well as develop versatile competencies applicable to various aspects of life and career domains.

Last, the dissertation, while acknowledging its limitations, opens avenues for future research.

Firstly, the research questions in the three empirical articles (Chapter 2, 3, and 4) focused on a few outcomes outlined in Chapter 1. This selective approach, while addressing urgent literature gaps, creates opportunities for future studies to explore the impact of Entrepreneurship Education on a broader spectrum of outcomes. Future research could delve into other dimensions and outcomes highlighted in the systematic literature review.

Secondly, the studies in the dissertation focus on cognitive characteristics and learning outcomes gathered through individuals' perceptions using secondary survey data. The use of alternative data collection methods, such as primary data, could extend the scope to investigate a wider range of cognitive processes, biases, and learning outcomes, including objective measurements and gender stereotypes.

Thirdly, the dissertation relies on quantitative analyses, prompting a call for future studies to implement qualitative and mixed methods. Longitudinal qualitative studies could offer insights into the evolving influence of Entrepreneurship Education over time,

providing a more comprehensive understanding of the learning outcomes and cognitive processes resulting from Entrepreneurship Education interventions.

Finally, recognizing the potential variations in the effects of Entrepreneurship Education courses and interventions over time, future research should consider long-term follow-up studies to capture changes in outcomes influenced by external contexts or factors, and contributing to a more nuanced understanding of the enduring impact of Entrepreneurship Education.

2. A SYSTEMATIC APPROACH TO THE EFFECTS OF ENTREPRENEURSHIP EDUCATION: A LITERATURE REVIEW ON TASK-RELATED AND NON-TASK-RELATED OUTCOMES

ABSTRACT

The importance of entrepreneurship as a key driver of job creation and economic growth is widely recognized. Entrepreneurial University, with its Entrepreneurship Education interventions and programs, aims to promote entrepreneurship in many ways. However, the role of the Entrepreneurial University goes well beyond venture creation. This study systematically reviews 160 empirical articles from 2000 to 2023 on the effect of Entrepreneurship Education. The findings reveal that previous research focused on assessing the impact of entrepreneurship courses solely on outcomes associated with entrepreneurship-related dynamics and venture creation. Embracing the Human Capital in entrepreneurship research [Marvel et al. (2016), *Entrepreneurship: Theory and Practice, 40(3), 599-626*], we first elaborate why a specific task-related investment in human capital, such as Entrepreneurship Education, could lead to both task-related and non-task-related outcomes; then we show that, despite such potential, the literature currently overlooks the non-task-related dimensions and only focus on task-related ones. In addition, this study presents a research agenda to identify which specific categories of outcomes require further exploration. The study emphasizes the need to focus on non-task-related knowledge, skills, and abilities that are beneficial for success in various domains, not just for aspiring entrepreneurs.

Keywords:
Entrepreneurship Education; Outcomes; Entrepreneurial University; Systematic Literature Review; Human Capital; Task-relatedness.

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The article "*Cascavilla, I., & Minola, T. (2022). A systematic approach to the effects of Entrepreneurship Education: a literature review on task-related and non-task-related outcomes*" presented at the Academy of Management PDW 2022 on Entrepreneurship Education and at 33rd AiIG Conference RSA (2022) was derived from the dissertation and particularly this chapter (Chapter 1).
I would like to thank the reviewers and participants of the workshop and conference who followed and commented on the research project offering valuable suggestions and feedback to improve this work, Prof. Howard E. Aldrich for his valuable advice, and Prof. Giovanna Campopiano for her comments and suggestions.

2.1. INTRODUCTION

The Entrepreneurial University, as an institution that actively promotes and supports entrepreneurial activities, innovation, and the commercialization of high-quality research and knowledge, orchestrates its core activities to promote entrepreneurship in our society (Guerrero et al., 2016; Guerrero and Urbano, 2020). In this respect, a key activity of the Entrepreneurial University is to nurture qualified individuals endowed with entrepreneurial human capital – that is various knowledge and skills that have an economic value (Becker, 1993; Martin et al., 2013; Marvel et al., 2016) – through investments in human capital such as education (Audretsch & Belitski, 2021; Marvel et al., 2016) and prepare them for the challenges of today's job market. For this purpose, Entrepreneurship Education (EE) programs have been growing rapidly (Duval-Couetil, 2013; Nabi et al. 2017) and universities have invested in EE to foster individuals with entrepreneurial knowledge, skills, abilities, attitudes, and intentions (Marvel et al., 2016; Dou et al., 2019). The strategic importance of EE as a support mechanism of the Entrepreneurial University for enhancing the entrepreneurship of its members has stimulated a vibrant academic debate regarding the actual impact of EE on individuals' founding activities and intentions (Eesley & Lee, 2021) and entrepreneurial attitude, self-efficacy, and skills (Fayolle & Gailly, 2015; Hahn et al., 2020). This growth has led to numerous reviews on EE outcomes: Carpenter & Wilson (2022), Duval-Couetil (2013), Nabi et al. (2017), Rideout & Gray (2013), and Pittaway & Cope (2007) among others. These works generally classify EE outcomes, considering, especially, entrepreneurship-related outcomes, into entrepreneurial (i) intentions, (ii) behaviors, (iii) self-efficacy, attitude, and other antecedents of intentions, and (iv) main learning outcomes such as skills and knowledge. By doing so, they provide systematic knowledge of the impact of EE (Nabi et al., 2017). Such systematization greatly helps our understanding of EE as a core activity of the Entrepreneurial University to stimulate entrepreneurship.

However, such systematization – built around entrepreneurship as venture creation aimed to encourage students to start their own company (Lackéus, 2015) – might also limit the variety of EE outcomes considered, thereby offering a somewhat partial recognition of the broader role of the Entrepreneurial University teaching mission (De Carolis & Litzky, 2019; Guerrero et al., 2016) and more in general, of the Entrepreneurial University in the Entrepreneurial Society (Audretsch, 2014). According to Lackéus

(2015), the essence of EE should not lie only in founding new organizations but rather in fostering traits such as creativity, opportunity recognition, proactivity, and innovation in a broader understanding of entrepreneurship applicable across diverse domains and different spheres of life. Indeed, a fundamental perspective lies in the recognition that EE could lead individuals to refine their attitude and inclination for generating value for others and not only for starting up their own company (Lackéus, 2015; Larsen, 2022; Mawson et al., 2023).

The literature has so far mostly focused on the link between EE and task-related human capital outcomes – that is human capital outcomes *related* to the venture tasks (Marvel et al., 2016), and overlooking the non-task-related dimension – that is human capital outcomes *not directly related* to venture tasks (Marvel et al., 2016). Such a gap is surprising for both theoretical and practical reasons. From a theoretical point of view, a growing number of studies stress that the unique learning experiences individuals are exposed to in entrepreneurship classrooms – such as stimulating creativity, innovativeness, proactiveness, teamwork, problem-solving, and dealing with failure and uncertainty – deeply contribute to the maturation of the personality, social and emotional traits of young adults following a broad definition of entrepreneurship that is relevant to all spheres of life (Lackéus, 2015; Larsen, 2022; Mawson et al., 2023). Without accounting for non-task-related outcomes as a key dimension of EE, our understanding of this core activity of the Entrepreneurial University would remain incomplete.

Besides nurturing entrepreneurial individuals through EE, the Entrepreneurial University could have a deeper impact on the personal development of young adults, equipping them with non-task-related knowledge, skills, and abilities useful for their lives. From a practical point of view, addressing this gap is particularly urgent to revise our conceptualization of the impact of the Entrepreneurial University considering the recent changes reshaping our society. Authors like Audretsch (2014) propose and invoke a broader strategic role of the Entrepreneurial University in the Entrepreneurial Society: it should not focus merely on technology transfer and venture creation, but rather aim also at forming creative and opportunity-oriented individuals endowed with entrepreneurial human capital, predisposed to identify and act upon new business opportunities in several life and societal domains (Walmsley et al. 2012). Such a call for an investigation is even more urgent today, as the non-task-related outcomes developed through EE could help

students and graduates address the pressing challenges of our society and deal with uncertainty caused by rapid changes. In the same vein, and especially in the wake of the digital transformation (Ritala et al., 2021), employers show a growing demand for a workforce that is ready to identify problems, propose solutions, and take risks to actively pursue them (Kuratko & Audretsch, 2022). Since non-task-related skills and abilities, and other changes in aspects of personality obtained through EE, could be crucial for the next generation to successfully deal with such challenges, a complete and updated assessment of the outcomes of EE – with particular attention to non-task-related outcomes (i.e., not directly related to venture tasks) – is very timely.

Hence, the main objective of this paper is to provide a comprehensive understanding of the types of outcomes individuals can achieve through EE systematizing the phenomena of both task-related and non-task-related outcomes.

To do so, we systematically review 160 articles on the effect of EE considering the outcomes studied in these articles. We first take advantage of the taxonomy by Marvel et al. (2016), which distinguishes between three main human capital constructs, namely Knowledge, Skills, and Abilities (KSA), and characterizes them in terms of task-relatedness to the entrepreneurship field: we investigate and classify the EE outcomes positioning them in the conceptual framework borrowed by Marvel et al. (2016). Then, we formulate a research agenda calling for more inquiry about categories of outcomes that should be investigated to refine our understanding of EE as a core and strategic activity of the Entrepreneurial University, as well as new perspectives and methodological designs that further research on EE should adopt.

The remainder of the paper is organized as follows: first, we analyze the research context mainly focusing on previous literature reviews on EE outcomes to define the novel positioning of this study and the Human Capital Theory, used as a conceptual framework to classify the EE outcomes emerged from the literature; next, we present the methodological approach, highlighting the Systematic Literature Review (SLR) process and the classification process of outcomes. Then, we report the descriptive statistics and main findings of the literature review, concluding with the discussion of the findings, and implications for future research.

2.2. RESEARCH CONTEXT

2.2.1. Previous literature reviews on Entrepreneurship Education outcomes

EE is increasingly important globally in higher education (Nabi et al., 2017). It is becoming more and more clear that EE programs provide the opportunity to create several potential entrepreneurship-related human capital assets and outcomes (Martin et al., 2013). As anticipated, we can find many contributions in terms of SLRs and meta-analysis on EE impact studies.

In order to provide a more in-depth overview of how past SLRs have addressed the topic of EE outcomes, we illustrate them in Table 1 specifying the author(s) and date of each SLR, the referring timeline (cf. *Study Period* column, Table 1), the target articles investigated in each SLR (cf. *Type of Research* column, Table 1), the list of outcomes investigated (cf. *Outcome(s)* column, Table 1), the approach used to classify and select the outcome(s) investigated (cf. *Approach* column, Table 1), the reference theory (if existing) used for classifying the outcomes (cf. *Reference Theory* column, Table 1), and focus on task-relatedness (cf. *Focus* column, Table 1) specifically to understand whether or not they discuss non-task-related outcomes.

Therefore, part of past SLRs focuses on one or more outcomes preselecting them *ex-ante* and evaluating how EE affects them (e.g., Bae et al., 2014; Martínez-Gregorio et al., 2021; Otache, 2019b); particularly, this affects the research query for their SLR.

Other SLRs, on the other hand, analyze possible EE outcomes *ex-post* (e.g., Carpenter & Wilson, 2022; Dickson et al., 2008; Longva & Foss, 2018; Martin et al., 2013; Nabi et al., 2017; Pittaway & Cope, 2007; Rideout & Gray, 2013) trying to detect all the possible outcomes that EE impact studies considered account for. However, the above SLRs that use an *ex-post* approach present some limitations: they do not cover EE outcomes that are not directly related to venture tasks (i.e., non-task-related outcomes), and no one uses the lens of Human Capital Theory, particularly the task-relatedness phenomenon, to analyze and systematize the literature on EE outcomes. Most of them focus only on task-related outcomes (Bae et al., 2014; Carpenter & Wilson, 2022; Dickson et al., 2008; Martin et al., 2013; Martínez-Gregorio et al., 2021; Otache, 2019b; Pittaway & Cope, 2007; Rideout & Gray, 2013); Nabi et al. (2017) aggregate the non-task-related outcomes under the label “other” without explicating them; also the articles

consulted in the SLR by Longva & Foss (2018) analyze non-task-related outcomes; nevertheless, the task-relatedness is not the focus of their SLR.

For these reasons, in our literature review, we adopt an *ex-post* approach trying to detect all possible outcomes starting from EE, and the main objective of this study is to discuss how existing literature has accounted for the phenomenon of task-relatedness.

Another significant aspect of this study is the application of Human Capital Theory in entrepreneurship research (Marvel et al., 2016) to categorize the EE outcomes. Reviewing the past SLRs on EE outcomes (cf. Table 1, *Reference Theory* used for classifying the outcomes)[1], we notice that only one took advantage of the Human Capital Theory in entrepreneurship research to classify the different types of outcomes that students achieve through EE (i.e., Martin et al., 2013), albeit rereferring only to generally "entrepreneurial human capital outcomes".

Therefore, in this study, we rely on Human Capital Theory in entrepreneurship research and particularly we borrow the taxonomy of human capital by Marvel et al. (2016) to analyze and classify the outcomes in EE impact studies expanding the taxonomy also to the EE literature and not only in entrepreneurship research in general.

[1] The *Reference Theory* column (Table 1) refers only and exclusively to the theories used to classify the outcomes, it does not refer to theories cited by articles in the literature reviews and meta-analyses indicated.

Table 1. Literature reviews and meta-analysis on EE outcomes studies.

Author/ Date	Study Period	Type of Research	Outcome(s)	Approach	Reference Theory	Focus
Carpenter & Wilson (2022)	2016-2019	SLR with 35 empirical papers – peer reviewed and grading of methodological quality – in a higher education context.	• Learning outcomes: business opportunity identification; entrepreneurial intention; entrepreneurial skills; perceptions of desirability and feasibility of starting a business; entrepreneurial inspiration; entrepreneurial mindset; students' risk propensity; ambiguity tolerance. • Venture/economic outcomes: entrepreneurial action; creating jobs, and income-generating activities.	Ex-post	*Not explicit*	Only task-related outcomes
Martínez-Gregorio et al. (2021)	1998-2020	SLR with 35 papers and meta-analysis of 23 quantitative papers – that used a pre- and post-test design and a control group – to investigate the efficacy of EE interventions on entrepreneurship intention and other outcome measures.	• Entrepreneurship intention. • Perceived Behavioral Control. • Self-efficacy. • Attitude toward entrepreneurship. • Social orientation. • Feasibility. • Risk-taking. • Need of achievement. • Desirability. • Subjective norm. • Entrepreneurial skills as proactivity and innovation (but not included in the meta-analysis as they have not been investigated in a sufficient number of studies).	Ex-ante	Theory of Planned Behavior (Ajzen, 1991) and Entrepreneurial Event model (Shapero & Sokol, 1982)	Only task-related outcomes
Otache (2019b)	2006-2018	SLR with 36 papers to explore the relationship between EE and undergraduate students' self- and paid-employment intentions.	• Attitude. • Subjective Norms. • Perceived Behavioral Control. • Employment intention (self-employment vs. paid employment). • Employment Behaviors (self-employment vs. paid employment).	Ex-ante	Theory of Planned Behavior (Ajzen, 1991).	Only task-related outcomes

Table 1. Literature reviews and meta-analysis on EE outcomes studies (continued).

Author/ Date	Study Period	Type of Research	Outcome(s)	Approach	Reference Theory	Focus
Longva & Foss (2018)	1997-2017	SLR with 17 impact studies on EE with an experimental or quasi-experimental strong design.	• Cognitive: ▪ Knowledge: comprehension of entrepreneurship; business basics. ▪ Traits: the need for achievement, proactiveness, self-esteem, and risk propensity. • Skill-based: business modeling; opportunity recognition; creative thinking; teamwork. • Affective: passion/inspiration; attitude to entrepreneurship; subjective norm. • Conative: entrepreneurial intention; entrepreneurial self-efficacy. • Behavioral: nascency; venture creation; intrapreneurship; social entrepreneurship; employability.	Ex-post	Merging of frameworks on learning outcomes (Fisher et al., 2008; Kyrö, 2008)	Presence of non-task-related outcomes
Nabi et al. (2017)	2004-2016	SLR with 159 EE impact studies published.	• Attitude. • Skills and knowledge. • Feasibility. • Entrepreneurial intention. • Business start-up. • Performance. • Other.	Ex-post	*Not explicit*	Presence of non-task-related outcomes
Bae et al. (2014)	1997-2013	Meta-analysis of 73 studies focusing on the relation between EE and entrepreneurial intentions.	• Entrepreneurial Intentions.	Ex-ante	*Not necessary since only one outcome is investigated and there is no need for classification*	Only task-related outcomes

Table 1. Literature reviews and meta-analysis on EE outcomes studies (continued).

Author/ Date	Study Period	Type of Research	Outcome(s)	Approach	Reference Theory	Focus
Martin et al. (2013)	1979-2011	Meta-analysis of 42 studies that have investigated the effectiveness of EE and training in increasing entrepreneurship-related human capital assets and/or entrepreneurship outcomes.	• Knowledge and skills, which comprised knowledge of entrepreneurship and entrepreneurial process. • Competency in identifying innovative business opportunities and competency in dealing with ambiguity in decision-making. • Positive perceptions of entrepreneurship, which comprised attitudes toward entrepreneurship, the desirability of becoming an entrepreneur, the feasibility of becoming an entrepreneur, and self-efficacy related to entrepreneurship. • Intentions to start a business. • Nascent behaviors, such as writing a business plan and seeking funding. • Start-up. • Entrepreneurship performance, which comprised financial success, duration of running a business, and personal income from the owned business.	Ex-post	Human Capital Theory (Becker, 1993)	Only task-related outcomes
Rideout & Gray (2013)	1997-2011	SLR with 12 methodological robust empirical papers	• Intention to start a business. • Self-efficacy. • Start-up skills. • Innovativeness. • Jobs created. • Sales. • Profits. • Business start-ups. • Income. • Job satisfaction. • Firm performance. • Learning competencies in legal, finance, marketing, and opportunity identification. • Tech writing. • Risk assessment. • Business ownership. • Retention. • GPA (Grade Point Average)..	Ex-post	*Not explicit*	Presence of non-task-related outcomes

Table 1. Literature reviews and meta-analysis on EE outcomes studies (continued).

Author/ Date	Study Period	Type of Research	Outcome(s)	Approach	Reference Theory	Focus
Dickson et al. (2008)	1995-2006	Meta-analysis of 54 empirical research linking either general education or specific forms of EE to either the creation of a new venture or some measure of entrepreneurial success.	• Rates of venture formation. • Perception of entrepreneurial opportunities. • Likelihood of becoming an entrepreneur. • Level of entrepreneurial activity. • Probability of self-employment. • Rates of firm births. • Probability of entry into either low or high-barrier ventures. • Probability of entry into high-quality ventures/low-quality ventures. • Likelihood of becoming an entrepreneur. • Rates of nascent entrepreneurship. • Growth expectations. • Venture growth. • Profitability. • Growth in performance. • Venture profits. • Innovation within the venture. • Operational sophistication. • Wealth accumulation.	Ex-post	*Not explicit*	Only task-related outcomes
Pittaway & Cope (2007)	1970–2004	SLR with 185 EE academic papers.	• Attitudes. • Business knowledge. • Take risks. • Personality traits. • Intentions. • Perceived barriers.	Ex-post	*Not explicit*	Only task-related outcomes

2.2.2. Theoretical grounding: Human Capital Theory and Entrepreneurship Education outcomes

Human Capital Theory (HCT) is an economic theory that posits that individuals can increase their economic productivity and earnings potential through investments in education, training, and other forms of skill development (Becker, 1993). The theory suggests that the skills, knowledge, and abilities that individuals possess can be viewed as a form of capital with an economic value.

Accordingly, people endorsed with a higher level of human capital are just as essential as other resources in the creation of goods and services, and proper investments in human capital may increase performance at the individual, group, organization, and country levels (Becker, 1993). HCT was originally developed to study the value of education as a type of investment in human capital (Becker, 1993). Indeed, education and training are the most important investments in human capital to raise individuals' earnings and productivity mainly by providing knowledge, skills, and a way of analyzing problems (Martin et al., 2013; Marvel et al., 2016; Unger et al., 2011). This line of inquiry has expanded to cover the knowledge and skills that are important to entrepreneurship (Marvel et al., 2016), where human capital is vital to discovering and creating entrepreneurial opportunities, acquiring financial resources, and launching ventures (Marvel et al., 2016); particularly it is EE that could lead to these outcomes (Martin et al., 2013).

Past research has demonstrated a link between general education and entrepreneurial success (Unger et al., 2011) or between EE and entrepreneurship-related human capital outcomes (Martin et al., 2013); nevertheless, it is not clear the link between EE and non-task-related human capital outcomes.

We exploit the human capital taxonomy provided by Marvel et al. (2016) and their literature review on the role of human capital in entrepreneurship research to (i) broaden and detail the types of human capital outcomes and (ii) investigate the outcomes related and non-related to the field of entrepreneurship and venture creation. Although we are aware that the task-related dimension is extensively investigated in the literature, we decided to keep it in our study for two main reasons: (i) to provide an update of all EE outcomes, (ii) to show how the task-related dimension is analyzed versus the non-task-related dimension.

Marvel et al. (2016) first distinguish between human capital investments such as education, training/experience, and recruitment; and human capital outcomes such as knowledge, skills, and abilities (Table 2).

Table 2.Typology of Human Capital from Marvel et al. (2016) p. 616.

	Investments	Outcomes
Impart	Education – investments in learning activities of explicit knowledge. • Vary from general to specific types of education. • Vary in cost, diversity, and length of the investment.	Knowledge – understanding of principles, facts, and processes. • Clustered within domains such as those learned through formal education. • Vary from generic to specific.
Develop	Training/experience – investments in learning by doing activities. • General or specific to context (e.g., industry) or task (e.g., prototype development). • Vary in terms of costs, amount, time, and type.	Skills – observable application of knowledge to create solutions to problems or complete specific tasks. • Specialized or domain-specific skills (e.g., industry or task-specific). • Vary in type from novice to expert.
Acquire	Recruitment – investments in recruitment activities to acquire abilities. • Sources may include venture teams, firm alliances, network ties, external R&D, etc. • Vary in cost, form, and quality.	Abilities – enduring, trait-like characteristics useful to range of tasks. • More general with implications to wide range of contexts and tasks. • Difficult to internally develop compared to knowledge or skills.

In particular, the taxonomy states that knowledge is usually clustered within domains such as those learned through formal education, skills from training and experiences in the field, and abilities from recruitment activities. Nevertheless, the causal relationship investment-outcome is not so restrictive since the three human capital outcomes mentioned can be gained through the combination of the three different types of human capital investments (Marvel et al., 2016).

Considering the investments, we are interested in education and training programs, specifically EE seen as task-related investment; on the contrary, we make greater use of the classification of human capital outcomes (Knowledge, Skills, and Abilities).

Beyond the definition of the three typologies of human capital outcomes, the taxonomy of Marvel et al. (2016) provides us with the definition of task-relatedness, which concerns whether or not human capital investments and outcomes are related to a specific task (Becker, 1993); in this case, the entrepreneurial task such as running a business venture (Marvel et al., 2016; Unger et al., 2011): (i) "*Task-related human capital includes those types of human capital that relate to the current task of the venture*" (Marvel et al., 2016, p. 608); and (ii) "*Non-task-related human capital includes types of human capital that do not directly relate to venture tasks*" (Marvel et al., 2016, p. 608).

We apply these definitions for the classification of outcomes detailed in the following section.

2.3. METHODOLOGY

2.3.1. Systematic literature review process

In terms of methodological approach, this study performs a SLR to identify the types of outcomes students can achieve through EE and classify their task-relatedness to venture tasks to detect which categories of outcomes are less investigated. The SLR is a well-established methodological approach to resume empirical evidence over long periods (Longva & Foss, 2018; Nabi et al., 2017; Pittaway & Cope, 2007) and the main feature of this method is its transparency and reproducibility.

We use the Scopus database and analyze 160 EE empirical impact studies published from 2000 to 2023[2]. The keywords used for the review include the "Entrepreneurial OR Entrepreneurship" AND "educat* OR program* OR cours* OR train*" terms in the title, and "impact* OR effect* OR outcome* OR output* OR affect* OR result*" in the title, or in the abstract or in the keywords. We consider only published articles written in English that report empirical findings; therefore, we exclude conceptual papers, pure literature reviews, and meta-analyses from the final sample, but the most recent literature reviews and meta-analyses (such as Longva & Foss, 2018; Martin et al., 2013; Nabi et al., 2017) have been considered to provide also further references. We limit our search to "peer-reviewed" publications and ranked journals. We first consider medium- and high-ranked journals listed in the Association of Business Schools (ABS 2021 $\geq$ 2) with some exceptions[3]: the review includes articles from 37 journals, both from high-ranked journals (e.g., Academy of Management, Learning and Education; Entrepreneurship: Theory and Practice; Journal of Business Research and Journal of Business Venturing) and from lower ranked journals which are specialized in research on business and entrepreneurship education (e.g., Education + Training; Industry and Higher

[2] This SLR is updated until the 23rd August 2023.
[3] We are aware of the fact that this method may have some limitations such as the potential exclusion of relevant articles, but it was necessary to guarantee the viability of this study by generating an adequate number of hits.

Education; International Entrepreneurship and Management Journal; International Journal of Management Education)[4]. The middle search hits 776 documents.

Subsequently, we review the titles, abstracts, and methodology sections of the articles and excluded those that did not meet at least one of the following inclusion criteria: (a) impact studies that use EE as the independent variable (e.g., Hahn et al., 2020); (b) impact studies that use EE as a moderator (e.g., Bischoff et al., 2020); (c) impact studies conducted within a particular entrepreneurial program whereby EE was elaborated upon and was not merely the empirical context (e.g., Huber et al., 2020) or (d) impact studies with mixed analysis (both qualitative and quantitative) and case studies that discuss the effects of EE (e.g., Lackéus, 2020). Particularly, we exclude from the sample those articles that did not explain the role of EE in the methodological section and analyses; this leads to 140 documents.

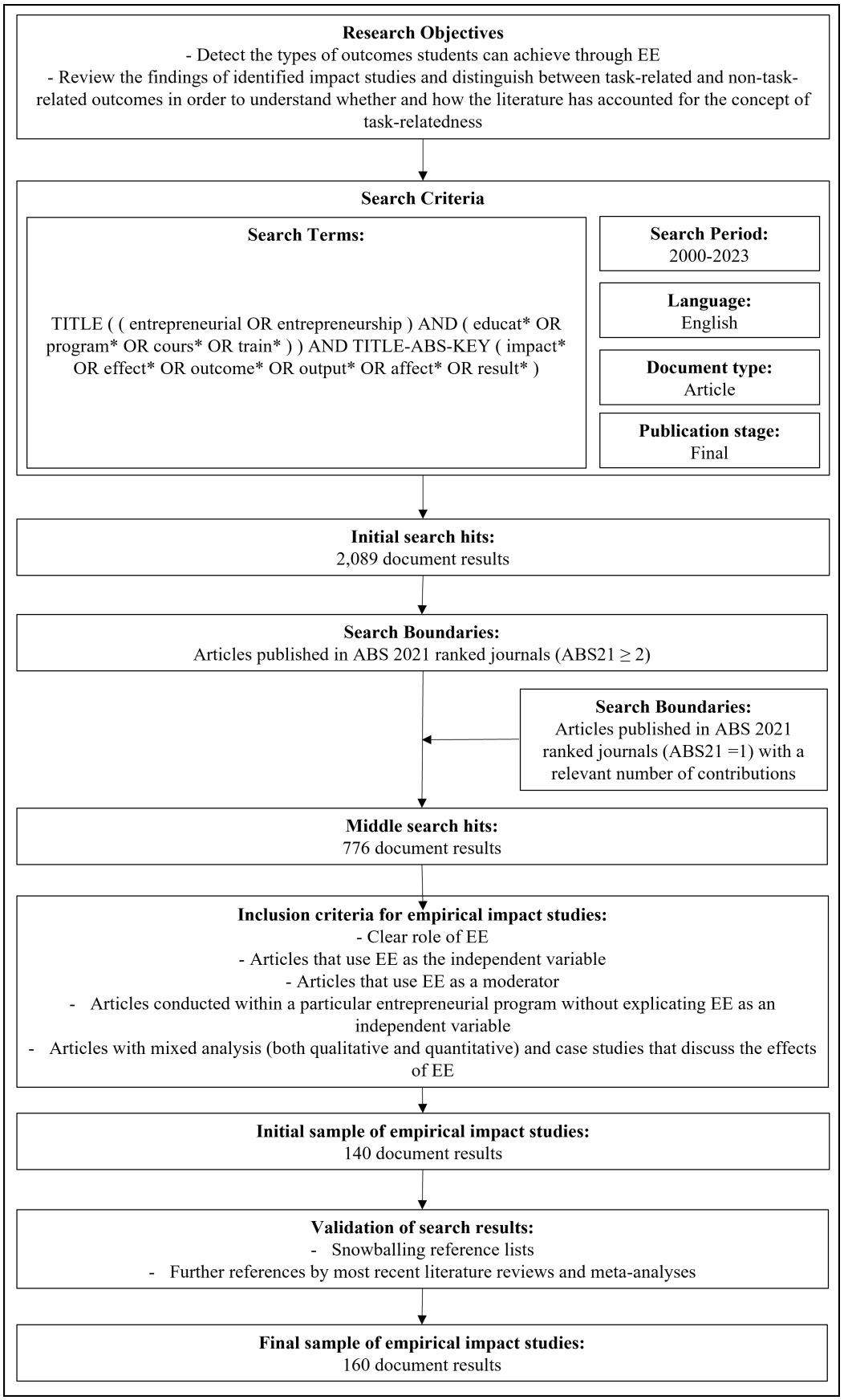
A particularly important inclusion criterion is the definition of EE in the empirical papers considered in this literature review; as we are looking for the impact and outcomes of EE interventions, we assume that the relevance of EE courses and programs should be evident in the article's description to assess the impact of such interventions as task-related investments.

As anticipated, the recent SLRs and meta-analyses have been considered to provide further references (15 additional articles) together with the snowballing process looking into the reference lists of sampled articles (5 additional articles): eventually, our sample of empirical impact studies is composed of 160 articles.

Figure 2 documents the stages of our SLR process.

[4] We consider also those journals with a lower ranking (ABS21 = 1), but which are considered in other literature reviews such as Nabi et al. (2017), and that through the research query lead to a significant number of contributions (i.e., Education + Training, Industry and Higher Education, International Entrepreneurship and Management Journal, International Journal of Management Education).

Figure 2. Stages in the SLR process.



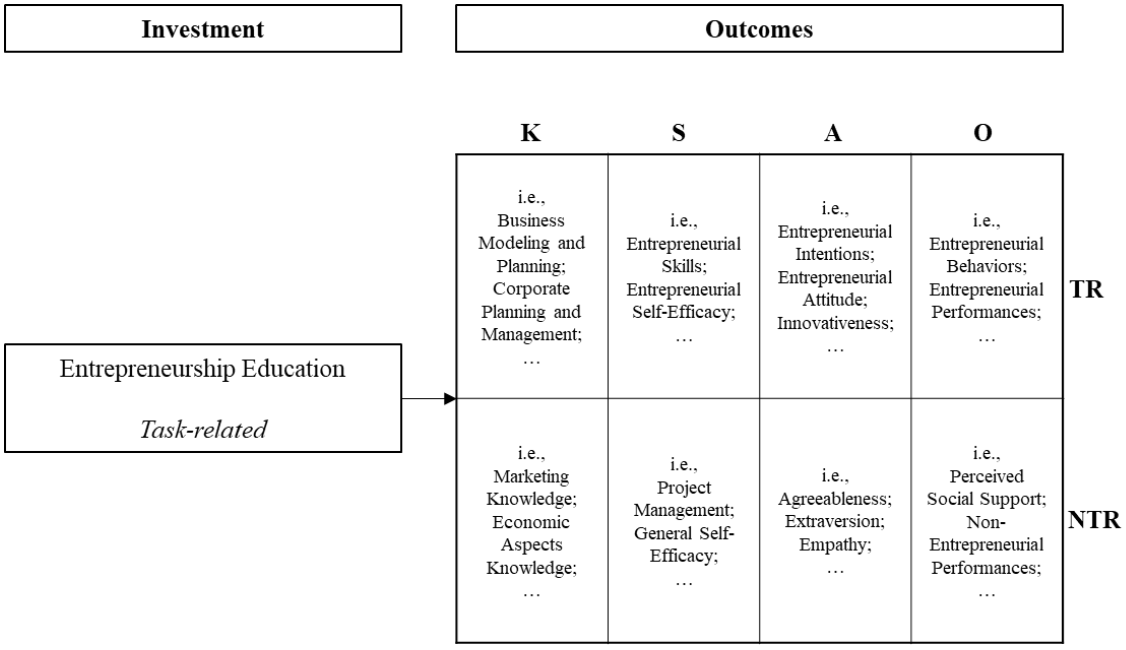
2.3.2. Conceptual framework and classification process of outcomes

Embracing a Human Capital perspective and basing our classifications on the definitions illustrated above, we implement the conceptual framework illustrated in Figure 3.

Considering the investment side, we consider EE as a task-related investment in human capital. Considering the outcomes side, we collect the full list of outcomes and then classifying them according to the taxonomy by Marvel et al. (2016) and considering the three main constructs of human capital (KSA) and their task-relatedness to the entrepreneurial field.

In doing so, we are also able to detect outcomes that do not belong to the KSA framework mentioned above (labeled "Others" in Figure 3)[5].

Figure 3. Conceptual framework.



K = Knowledge; S = Skills; A = Abilities; O = Others; TR = Task-related; NTR = Non-task-related.

To do so, two authors separately conducted the analysis classifying and allocating the outcomes in the categories illustrated in Figure 3. The study carried out in this literature review is aimed at mapping the state of the art on EE outcomes, their typology, and their task-relatedness. The evaluation of each outcome is based on the definition and the measurement method adopted in each article of this study; it may therefore be that an

[5] The full classification of outcomes is reported in Table 12.

outcome can be repeated more than once, that can belong to more the one category, and that can be measured both in task-related and non-task-related terms.

2.4. RESULTS

2.4.1. Descriptive statistics

The 160 articles sampled cover research published in 37 journals, predominantly in ABS list's subject areas of Management Development and Education (69 articles; 43.1%) and Entrepreneurship and Small Business Management (65 articles; 40.6%) as reported in Table 3.

Table 3. Distribution of articles and journals for each ABS subject area considered in the study sample.

ABS Subject Area	No. of articles	%	No. of journals	%
Management Development and Education	69	43.1	8	21.6
Entrepreneurship and Small Business Management	65	40.6	14	37.8
General Management, Ethics and Social Responsibility	10	6.3	5	13.5
Economics, Econometrics and Statistics	7	4.4	4	10.8
Innovation	4	2.5	2	5.4
Strategy	2	1.3	1	2.7
Social Sciences	1	0.6	1	2.7
Psychology	1	0.6	1	2.7
Regional Studies, Planning and Environment	1	0.6	1	2.7
Total	**160**	**100**	**37**	**100**

Considering the ABS ranking (Table 4), we can notice that most of the articles are ranked below "2".

Table 4. Distribution of articles considering the ABS Ranking.

ABS Ranking	No. of articles	%
4*	8	5.0
4	9	5.6
3	58	36.3
2	28	17.5
1	57	35.6
Total	**160**	**100**

The number of articles published in high-impact journals (with a ranking above or equal to "3") is 75 (46.9%).

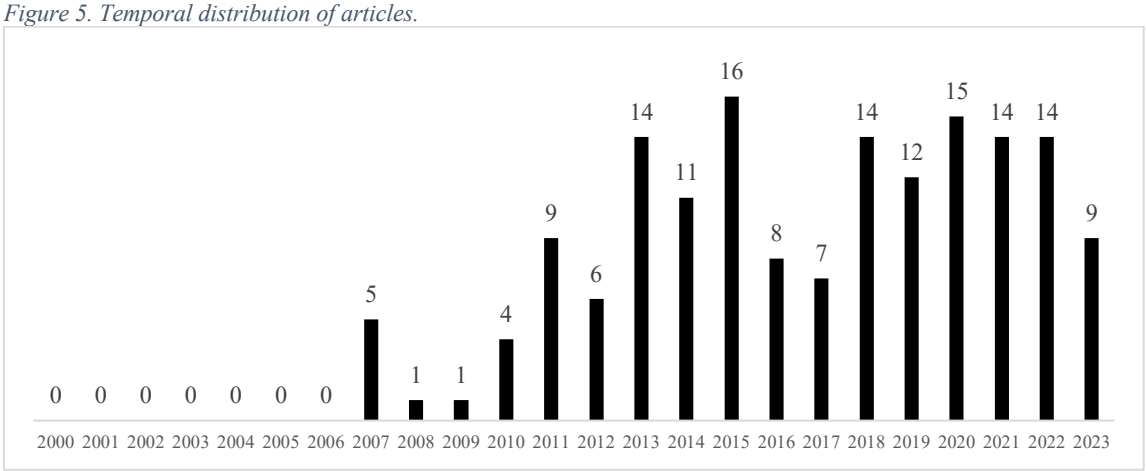
Figure 4 shows the list of all journals: the academic journals that published the most papers on EE outcomes were *Education + Training* (33 articles; 20.6%), *Journal of*

Small Business Management (16; 10.0%), and *International Journal of Entrepreneurial Behaviour and Research* (12; 7.5%).

Figure 4. Distribution of articles considering the publishing journals.

Then, we represent the distribution of articles considering the timeline (Figure 5): there is a visible growth, with more than half of the articles were published during the last 10 years (from 2014 to 2023: 120 articles; 75%).

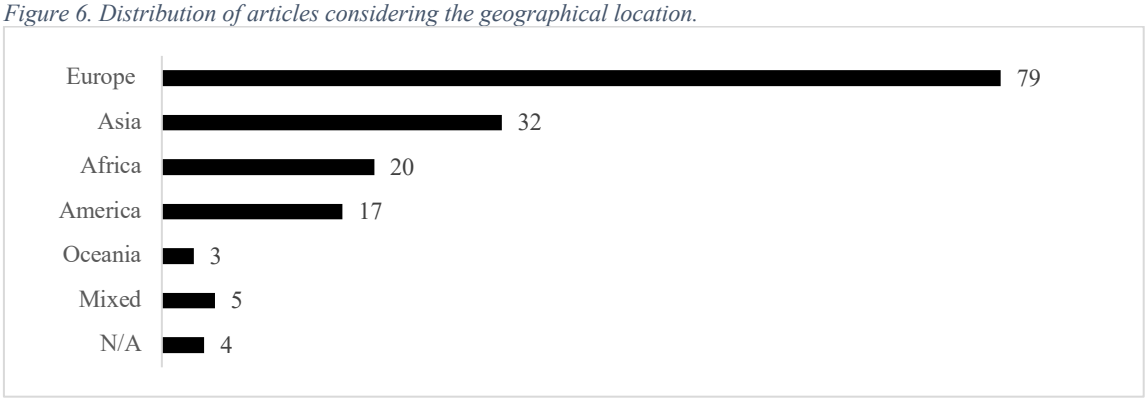
Figure 5. Temporal distribution of articles.



No empirical contribution to measure EE's impact on outcomes was published before 2007. Indeed, before that year, the literature on EE was still at an exploratory stage aimed at simply describing courses, programs, or trends in EE without revealing the benefits that individuals can derive from this type of education (Souitaris et al., 2007).

With respect to the geographical location of the sample (Figure 6), most of the articles developed their empirical research in Europe (79 articles; 49.4%), followed by Asia (32 articles; 20.0%) and Africa (20 articles; 12.5%).

Figure 6. Distribution of articles considering the geographical location.



Considering the articles' sources, most of them derive from our research query (140 articles, 87.5%); then, the recent literature reviews and meta-analyses have been considered to provide further references and particularly 15 articles (9.3%) derive from Nabi et al. (2017) (i.e., Abaho et al., 2015; Armstrong, 2014; Chang & Rieple, 2013; Chang et al., 2014; Díaz-Casero et al., 2012; Gilbert, 2012; Heinonen et al., 2011; Izquierdo & Buelens, 2011; Jones et al., 2011; Kirkwood et al., 2014; Lourenço & Jayawarna, 2011; Morris et al., 2013; Muñoz et al., 2011; Saeed et al., 2015; Solesvik,

2013), and 5 derive from snowballing references (i.e., Bell, 2020; Lackéus & Sävetun, 2019; Memon et al., 2019; Rippa et al., 2020; Shinnar et al., 2018)[6].

Considering the inclusion criteria mentioned above and the role of EE described in the articles, most of the articles (88 articles; 55.0%) were selected because they use EE as the independent variable; followed by those articles conducted within a particular entrepreneurial program or course without explicating EE as a variable but explicating its role (40 articles; 25.0%), then those articles with mixed analysis and case studies (19 articles; 11.9%); and articles that use EE as moderator variable (13 articles; 8.1%).

Particularly, an important inclusion criterion was that the articles define clearly EE and its role. Therefore, we provide descriptive statistics about the types of EE interventions of the sampled articles focusing on the type of EE course or intervention (Table 5) and the teaching models and pedagogical methods used (Table 6).

Table 5. Distribution of articles considering the role of EE and the type of course.

Type of EE course	**N**	**%**
Specific EE course	99	61.9
of which:		
• *Elective*	*20*	*20.2*
• *Compulsory*	*10*	*10.1*
• *Not specified*	*69*	*69.7*
Entrepreneurial degree or program	6	3.8
EE in general	55	34.4
Total	**160**	**100**

Since the teaching models and pedagogical methods are key dimensions of any teaching program (Nabi et al., 2017; Pittaway & Cope, 2007), we borrow the teaching model framework provided by Nabi et al. (2017) highlighting in our descriptive statistics the role of the EE: most of the articles describe the teaching models used in their study (87 out of 160; 54.4%), of which only 15 deal with making a comparison between different courses with different teaching methods or pedagogical methods (Table 6). Separating the studies into the categories of EE, most of the EE interventions (35; 21.9%) can be categorized as Competence Model (c.f. Béchard & Grégoire, 2005) or education through entrepreneurship (Hannon, 2005)[7] which are practice-oriented teaching models based on learning by doing activities.

Table 6. Distribution of articles considering EE teaching models.

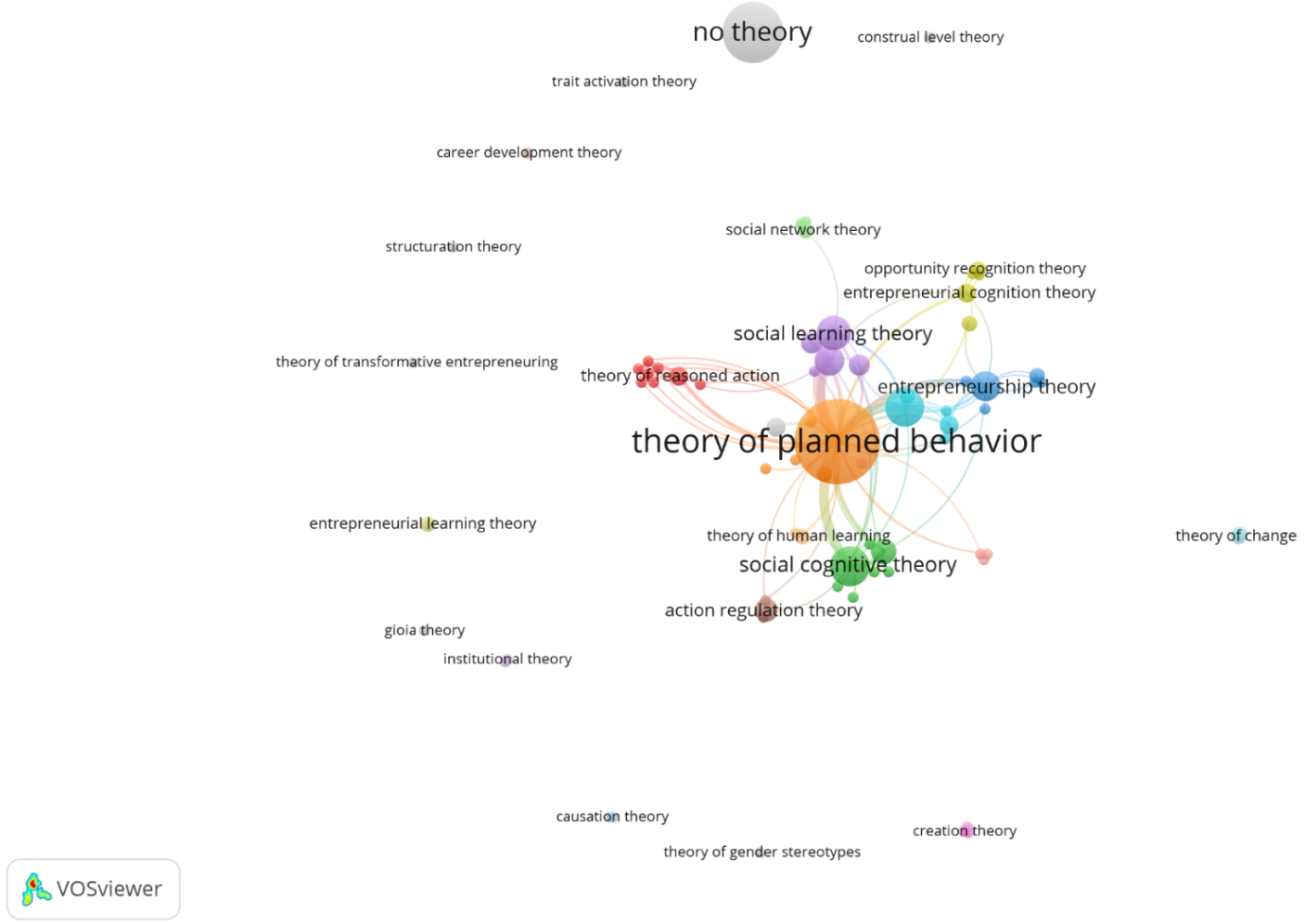
[6] The 20 articles added through the consideration of previous SLRs and snowballing references lead to 6 new outcomes.

[7] According to Cascavilla et al. (2022), the Béchard & Grégoire (2005) classification of the three teaching models – *Supply, Demand, and Competence Model* - is consistent with the earlier classification from Hannon (2005) – *education about, for, and through entrepreneurship*.

Teaching Model	Definition	N	%
Not specified	-	73	45.6
Supply model *or* Education about entrepreneurship	Supply Model: teaching model aimed to convey information and knowledge about entrepreneurship with an emphasis on the teacher's expertise and what the teacher knows (Béchard & Grégoire, 2005); Education about entrepreneurship: teaching model aimed to teach students about the entrepreneurship phenomenon from content and theoretical perspectives (Hannon, 2005).	8	5.0
Demand model *or* Education for entrepreneurship	Demand Model: teaching model aimed to foster skills through experiential and participatory approaches like exploration, simulation, and discussion, placing the focus on the individual learning needs of students (Béchard & Grégoire, 2005); Education for entrepreneurship: teaching model based on enhancing students' practical entrepreneurial skills by using hands-on exercises and laboratory activities for generating and validating ideas (Hannon, 2005).	9	5.6
Competence model *or* Education through entrepreneurship	Competence model: teaching model aimed at gaining competencies through practical methods, incorporating external experts, and addressing real-world challenges; this approach centers education around the interactions among the context, the teacher, and the students (Béchard & Grégoire, 2005); Education through entrepreneurship: teaching model aimed at equipping students for entrepreneurial endeavors by emphasizing experiential learning with a focus on nurturing an entrepreneurial mindset and attitudes (Hannon, 2005).	35	21.9
Hybrid models	Mixture of above	20	12.5
Comparison between teaching models or course characteristics	-	15	9.4
Total		**160**	**100**

From a theoretical point of view, research about EE outcomes has drawn on a wide range of theoretical perspectives with the Theory of Planned Behavior (Ajzen, 1991) playing a dominant role (77 out of 160 articles). Instead, 37 articles declare no theories in their analysis. Despite the importance of Human Capital Theory in educational settings to assess possible human capital assets and outcomes, only 14 articles out of 160 (8.8%) rely on this theory. Figure 7 represents the co-occurrence analysis of the theories employed in the study sample. This visualization serves to emphasize the extent of investigation for each theory, represented by the size of the circles, and the relationships between these theories, indicated by the thickness of the connecting lines. To perform this analysis, we use VosViewer software. Initially, we code the theories used in each article, noting both the presence and frequency of their use. The resulting output reflects that each article may delve into one or more theories or none at all.

Figure 7. Analysis of theories used in the sample of articles.



Considering the empirical methodology of the articles (Table 7), most of the studies are based on quantitative analyses (131 articles; 81.9%), only 15 articles (9.4%) report qualitative studies and the remaining 14 are based on mixed methods (both quantitative and qualitative such as qualitative comparative analysis). Particularly, the measurement methods of the quantitative studies are mostly based on using survey and questionnaires (124 articles) and only 7 used multiple measurement methods (such as using surveys combined with interviews but using a quantitative approach); considering the qualitative studies, 11 articles used (semi-structured) interviews and 4 used diaries and observational notes; for those articles that used mixed methods (both quantitative and qualitative), 11 articles used surveys/questionnaires in combination with qualitative interviews (i.e., Cornwall et al., 2015; Farhangmehr et al., 2016; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Nabi et al., 2018), or observational notes and data (i.e., Chang & Rieple, 2013; Gilbert, 2012; Ilonen et al., 2018; Rodríguez-López & Souto, 2019), or focus groups (i.e., Florin et al., 2007); and 3 articles used surveys/questionnaires – and particularly using fuzzy-set qualitative comparative analysis (fsQCA; Porfírio et al., 2023), qualitative comparative analysis (QCA; Rippa et al., 2020), and qualitative contrasting case analysis (QCCA; Fretschner & Weber, 2013).

Since it may be that EE impact studies have contradictory findings due to methodological artifacts such as cross-sectional designs and lack of control groups (Nabi et al., 2017), we report the descriptive statistics about the design of investigated articles (Table 7): there is a quite balanced situation between cross-sectional (85 articles) and longitudinal designs (75 articles). Then, considering the presence of a control group in the analysis, only 44 articles out of 160 have a control group and, of these, 34 articles adopt a longitudinal study with pre- and post-investigation, and 10 articles are cross-sectional.

Table 7. Design of the study sample articles.
a)

	Cross-sectional	**Longitudinal**	**Total**
Quantitative	72	59	131
Qualitative	9	6	15
Mixed	4	10	14
Total	**85**	**75**	**160**

b)

	Without control group	With control group	Total
Quantitative	88	43	131
Qualitative	15	0	15
Mixed	13	1	14
Total	**116**	**44**	**160**

Following, 42 studies out of 160 declared to perform an experimental or quasi-experimental design, and, in line with Longva & Foss (2018), the number of experimental studies has increased considerably in recent years. Indeed, the experimental and quasi-experimental designs are considered to be rigorous research designs and appropriate to assess the impact of EE interventions (Longva & Foss, 2018)[8].

Since EE is increasingly important globally at all levels of study and across different fields of study (Hahn et al., 2020), and not only in higher education institutions (Nabi et al., 2017) but also in primary (Huber et al., 2014) and secondary schools (Blimpo & Pugatch, 2021), we provide below descriptive statistics about the study sample of articles included in the literature review considering the attendees' level of study (Table 8) and field of study (Table 9).

Table 8. Distribution of attendees' level of study.

Level of study (whole sample)	N	%
Primary school	4	2.5
Secondary school	12	7.5
University	124	77.6
Other or Mixed	20	12.5
Total	**160**	**100**

a) University students:

Level of study	N	%
Undergraduate (Bachelor)	53	42.7
Graduate (Master)	10	8.1
PhD	2	1.6
Mixed (e.g., Bachelor and Master students)	40	32.3
Not available	19	15.3
Total	**124**	**100**

[8] Compared to Longva & Foss (2018), no evaluation work has been done in order to classify strong and weak experimental designs.

b) Other or Mixed:

Level of study	N	%
MBA	1	5.0
Mixed (e.g., graduated and unemployed: graduated and alumni)	9	45.0
Alumni	1	5.0
University of Applied Science	1	5.0
Entrepreneurs and professionals	3	15.0
Not available	5	25.0
Total	**20**	**100**

Considering the attendees' levels of study (Table 8), most of the articles focus their attention on students enrolled in higher education (124 articles; 77.6%) and only 16 articles focus their attention on earlier education such as primary or secondary school.

Considering the attendees' fields of study (Table 9), most of the articles consider in their analysis the individuals that belong to the Business and Management area (47 articles) or cross-disciplinary classes with attendees from different fields of study (47 articles). From the analyses, we note that only one article carries out its study with individuals belonging only to the Social Sciences and Psychology area (i.e., Fernández-Pérez et al., 2019), underlining that EE is not widespread in all faculties and subject areas.

Table 9. Distribution of attendees' field of study.
a) University students:

Field of study	N	%
Business and Economics	47	37.9
Natural Sciences/Technical	9	7.3
Social Sciences and Psychology	1	0.8
Cross-disciplinary	47	37.9
Not available	20	16.1
Total	**124**	**100**

b) Other or Mixed:

Field of study	N	%
Business and Economics	2	10.0
Cross-disciplinary	6	30.0
Not available	12	60.0
Total	**20**	**100**

Then, we also consider the level of analysis of each article: most of the studies are based on analyses at the individual level (150 articles; 93.8%), confirming the strong bias toward the individual-level research of previous literature reviews (Marvel et al., 2016; Nabi et al., 2017).

We also detect for each article if there was a gender focus since, as suggested by Nabi et al. (2017), EE impact studies should examine if the effect of EE on outcomes is

gender-specific: only 28 articles out of 160 (14.5%) have a gender focus in their analyses; among them, 14 use gender as moderator, 9 perform a sample split analysis by gender accounting for differences, 3 articles use gender as independent variable and 2 articles use a sample of only women.

2.4.2. Review findings

Through our analysis, we obtain a total of 143 outcomes. Based on the results from the selected contributions, two main themes are identified: the type of outcome (K, S, A, and O), and their task-relatedness to venture tasks (TR and NTR).

The table below (Table 10) represents the summary of the number of outcomes considering their classification across the two dimensions mentioned above. Findings show that 75 out of 143 are non-task-related outcomes and most of them are abilities (46 out of 75; 61.3%); despite the main aim of education being to transmit knowledge, in EE literature the knowledge outcomes are overlooked (27 out of 143; 18.9%).

Table 10. Number of outcomes considering the type of outcome and their task-relatedness.

	TR	**NTR**	**Total**
K	15	12	**27**
S	21	14	**35**
A	26	46	**72**
O	6	3	**9**
Total	**68**	**75**	**143**

From this first evidence, the concept of non-task-related outcomes is recognized in the EE literature; nevertheless, although the number of non-task-related outcomes is higher than task-related outcomes, further analysis is needed to understand the extent to which these outcomes are investigated.

Table 11 reports the number of articles that account for each category of outcomes; each article can investigate multiple categories of outcomes at the same time; this is why the sum provides more than 160 counts.

Table 11. Number of articles and percentage considering the type of outcome and their task-relatedness.

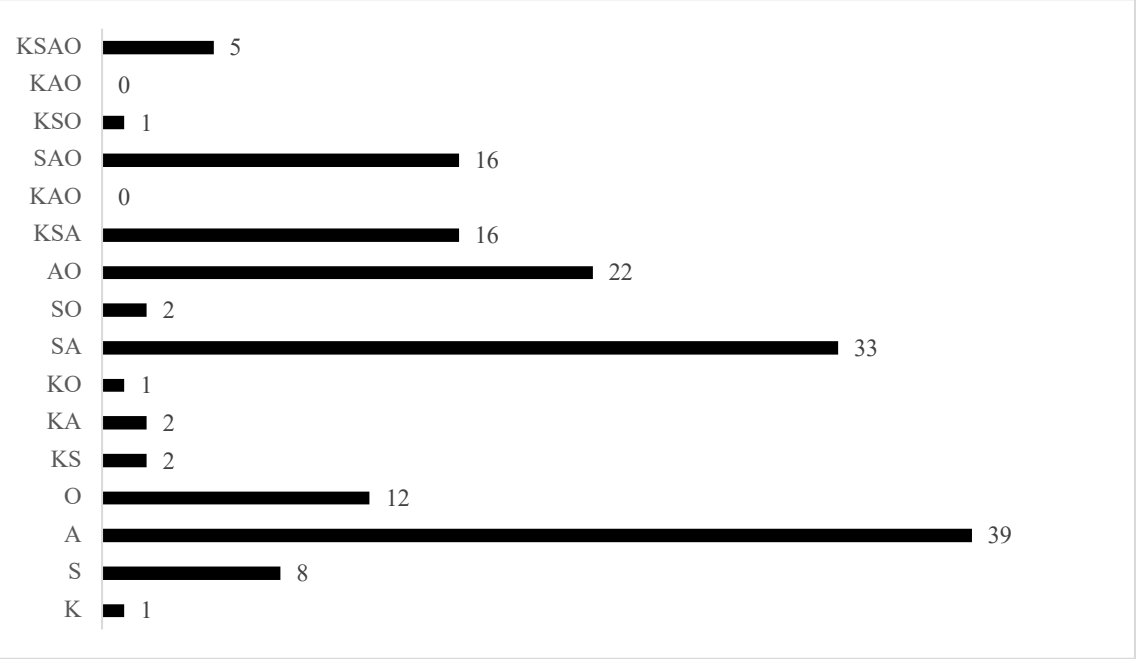
	TR		**NTR**	
	N	*%*	*N*	*%*
K	28	17.5	5	3.1
S	79	49.4	22	13.8
A	125	78.1	35	21.9
O	56	35.0	4	2.5

As suspected, not so many articles account for the non-task-related dimension; 117 articles out of 160 (73.1%) account for only task-related outcomes and 43 articles (26.9%) account for both task-related and non-task-related outcomes in their analysis. There is not even one article that analyzes only the non-task-related dimension but rather is always analyzed in parallel with the task-related dimension: it means that despite the conceptual effort to try to study non-task-related outcomes, the literature tends to investigate more the task-related dimension.

The most investigated category of outcomes is "task-related abilities" (78.1 % of the articles account for this category), followed by "task-related skills" (49.4%); this is in line with previous literature reviews (Martin et al., 2013; Nabi et al., 2017) since the most investigated outcomes are "Entrepreneurial Intention" as task-related ability (90 articles out of 160 of which 16 articles out 90 investigate as single outcome; cf. Table 12), "Entrepreneurial Attitude" as task-related ability (35 articles out of 160; cf. Table 12), and "Entrepreneurial Self-Efficacy" as task-related skill (29 articles out of 160; cf. Table 12). In addition, 16 articles investigate the constructs of the Theory of Planned Behavior (i.e., Entrepreneurial Intention, Entrepreneurial Attitude, Perceived Behavioral Control and Subjective Norms) in their analysis (i.e., Duong, 2022; Fayolle & Gailly, 2015; Feder & Niţu-Antonie, 2017; Galvão et al., 2018; González-López et al., 2019; Karimi, Biemans, Lans, Chizari, et al., 2016; Martins et al., 2022; Mueller, 2011; Otache et al., 2021; Passaro et al., 2018; Solesvik, 2013; Souitaris et al., 2007; Varamäki et al., 2015; Zampetakis et al., 2015), but only one fully test the Theory of Planned Behavior with also the Entrepreneurial Behavior as outcome (Souitaris et al., 2007); several articles partially test the Theory Planned Behavior, thus not considering all the antecedents of intentions, of which 7 articles account for all the constructs (i.e., Debarliev et al., 2020; Entrialgo & Iglesias, 2016, 2017; Ng et al., 2021; Rauch & Hulsink, 2015; von Graevenitz et al., 2010; Zaryab & Saeed, 2018); 5 articles fully test the Entrepreneurial Event Model considering the three constructs Entrepreneurial Desirability, Entrepreneurial Feasibility and Entrepreneurial Intention (i.e., Armstrong, 2014; Boukamcha, 2015; García-Rodríguez et al., 2018; Pergelova et al., 2023; Volery et al., 2013) or partially accounting not for all the constructs (i.e., Farashah, 2013; von Graevenitz et al., 2010).

To get a more complete view of how many articles investigate which outcome typology (K, S, A, and O), we propose a summary in Figure 8.

Figure 8. Number of articles



Despite EE being an investment in human capital and Knowledge, Skills, and Abilities are human capital outcomes, only 16 articles out of 160 in their analysis account for the three dimensions of human capital (cf. KSA, Figure 8). Most of them focus only on *Abilities* (cf. A, Figure 8; 39 articles) or *Abilities* in combination with *Skills* (cf. SA, Figure 8; 33 articles) since the most investigated outcomes – as mentioned above – are Entrepreneurial Intention, Entrepreneurial Attitude, and Entrepreneurial Self-Efficacy.

Last, Table 12 represents the full classification of outcomes[9].

[9] The classification including also the articles of the literature review is available in the Appendix.

Table 12. Summary of outcomes (number of articles in brackets).

	TR	NTR
K	***N. of outcomes = 15; N. of articles = 28***	***N. of outcomes = 12; N. of articles = 5***
	Entrepreneurial Knowledge (15); Learning Outcomes (4); Entrepreneurial Self-Insight (3); Perceive Barriers to Entrepreneurial Career (3); Business Modelling and Planning (2); Action Knowledge (1); Business Risk (1); Corporate Planning and Management (1); Financial Mental Models (1); IP Management (1); Marketing Knowledge (1); Marketing Research Knowledge (1); Negotiation Competencies (1); Perceived Personal Benefits (1); Social and Economic Performance (1).	Finance Knowledge (2); Organization and Management of Resources (2); School Subject Knowledge (2); Self-Insight (2); Accounting and Auditing Knowledge (1); Basic Law Issues Knowledge (1); Business Strategy (1); Economic Aspects Knowledge (1); Fiscal Aspects Knowledge (1); Management Accounting (1); Marketing Knowledge (1); Mental Models (1).
S	***N. of outcomes = 21; N. of articles = 79***	***N. of outcomes = 14; N. of articles = 22***
	Entrepreneurial Self-Efficacy (29); Opportunity Skills (16); Learning Outcomes (14); Entrepreneurial Skills (13); Business Modelling and Planning (8); Entrepreneurial Feasibility (6); Creativity (4); Financial and Accounting Competencies (4); Business Idea Generation and Development (3); Communication and Presentation Skills (3); Strategic Skills (3); Business Skills (2); Feasibility of the Idea (2); Business Project Management (1); Divergent Thinking (1); Guerrilla Skills (1); Management Competencies (1); Market Research Competencies (1); Planning and Plan-making (1); Social Entrepreneurial Self-Efficacy (1); Wealth Generation (1).	General Self-Efficacy (10); Organization and Management of Resources (6); Creativity (5); Learning Outcomes (3); Marketing Skills (3); Business Skills (2); Personal Organization (2); Project Management (2); School Subject Skills (2); Study Skill (2); Action Plan (1); General Skills (1); Risk, Ambiguity and Uncertainty Management (1); Technical Skills (1).
A	***N. of outcomes = 26; N. of articles = 125***	***N. of outcomes = 46; N. of articles = 35***
	Entrepreneurial Intentions (90); Entrepreneurial Attitude (35); Perceived Behavioral Control (21); Entrepreneurial Motivation (8); Entrepreneurial Identity (7); Entrepreneurial Desirability (6); Learning Outcomes (6); Risk Taking Propensity (6); Innovativeness (5); Entrepreneurial Passion (4); Entrepreneurial Self-Confidence and Self-Esteem (4); Decision Making (3); Entrepreneurial Awareness (3); Entrepreneurial Inspiration (3); Entrepreneurial Mindset (3); Entrepreneurial Alertness (2); Entrepreneurial Orientation (2); Need for Achievement and Achievement Motivation (2); Networking Competencies (2); Social Orientation (2); Entrepreneurial Aspiration (1); Entrepreneurial Commitment (1); Intrapreneurial Intentions (1); Managing Ambiguity (1); Motivation to Study Entrepreneurship (1); Personal Control (1).	Interpersonal Abilities and Leadership (8); Need for Achievement and Achievement Motivation (7); Proactiveness and Sense of Initiative (7); Tenacity and Perseverance (7); Problem Solving (6); Resilience, Persistence and Endurance (6); Ambiguity and Uncertainty Tolerance (5); Networking Competencies (5); Innovativeness (4); Optimism (4); Teamworking and Collaboration Abilities (4); Adaptation and Flexibility (3); Locus of Control (3); Need for Power and Power Motivation (3); Openness (3); Paid-employment Intentions or Being an Employee (3); Risk Taking Propensity (3) Agreeableness (2); Conscientiousness (2); Decision Making (2); Emotional Stability (2); Extraversion (2); General Passion (2); Impulsiveness (2); Learning Exploitation Intention (2); Moral Obligation and Civic Participation (2); Need for Autonomy and Need for Independence (2); Passion for Work (2); Patience (2); Polychronicity (2); Self-Confidence (2); Self-Esteem (2); Critical Behavior (1); Empathy (1); General Aspiration (University and Professional) (1); General Attitude (1); General Motivation (1); Grit (1); Individual Work (1); Learning Desirability (1); Non-conformity (1); Other Orientation (1); Personal Control (1); Personal Maturity Abilities (1); Responsibility (1); Training Retation (1).
O	***N. of outcomes = 6; N. of articles = 56***	***N. of outcomes = 3; N. of articles = 4.***
	Entrepreneurial Behaviors (28); Subjective Norms (21); Entrepreneurial Performances (10); Team Behaviors and Processes (2); Intrapreneurial Activity (1); Perceived Social Support (1).	Non-Entrepreneurial Performances (2); Deep Learning (1); Future Events (1).

2.5. DISCUSSION

Guided by the Human Capital Theory framework, the purpose of this research is to review a range of EE impact studies published from 2000 to 2023 in order to identify gaps in the current research and suggest new directions for future studies.

The study proposes an extension of the taxonomy by Marvel et al. (2016) considering the context of EE, as a type of investment in human capital, and classifying the EE outcomes in Knowledge, Skills, and Abilities. Moreover, to the best of our knowledge, this study is the first literature review that accounts for the task-relatedness of EE outcomes.

2.5.1. Future research directions

Our systematization and classification of EE outcomes reveals four main findings described as follows considering (i) new dependent variables, (ii) new contingencies, (iii) methods and design, (iv) new settings.

New dependent variables. First, we confirm that the non-task-related dimension of all categories is not investigated much in the literature despite, in terms of the number of outcomes, the literature recognizes the presence of non-task-related outcomes. Most studies focus on the cognitive constructs that are supposed to contribute to venture creation activities (e.g., entrepreneurial skills and knowledge, attitude, self-efficacy, entrepreneurial intentions) and on entrepreneurial behaviors. Such general focus reflects the dominant idea that EE should nurture entrepreneurial individuals, predisposed to engaging in venture creation activities. Moreover, even though there are articles that account for non-task-related outcomes, the task-related dimension is always present. Although it is known that EE could affect non-task-related outcomes, we still lack sufficient evidence and theoretical development on the relationship between EE and these types of outcomes and the boundaries. This severely limits our understanding of the learning outcomes obtained through EE and urgently calls for future research.

Indeed, EE empirical studies tend to overlook the significance of non-task-related outcomes which are relevant to underpin success in many life domains and not only in the entrepreneurial field and we suggest investigating also the less populated cells of EE outcomes (cf. Table 12), for example the Big Five of personality (conscientiousness, 2 articles; openness to experience, 3 articles; extraversion, 2 articles; agreeableness, 2

articles; and emotional stability, 2 articles). Generally, personality traits, including those in the Big Five model, exhibit a degree of stability over time; yet, this stability is not absolute and there are factors that can contribute to changes in personality across the lifespan (Roberts et al., 2006; Specht et al., 2011). For example, EE interventions can lead to changes in Big Five dimensions (i.e., Alaref et al., 2020; Premand et al., 2016; Ulvenblad et al., 2013).

Second, despite the primary focus of education as an investment in human capital should be imparting knowledge (Marvel et al., 2016), EE literature tends to overlook knowledge as a possible and valuable outcome compared to skills and abilities (19.9% of outcomes accounted by 20.6% of articles). Therefore, there is a need for studies that focus on knowledge as a key outcome of EE both in task-related and non-task-related terms. We suggest verifying that individuals who have participated in EE courses have actually acquired the key knowledge, possibly also through objective measurement methods and not only through individuals' self-evaluation and subjective measurements. Nevertheless, we recognize that evaluating outcomes in an entrepreneurial course, and specifically learning outcomes such as knowledge, involves considering the advantages and disadvantages of both subjective and objective assessment methods: subjective measures, like self-evaluation of achieved outcomes, offer insights into students' perceptions and attitudes, but they can be influenced by biases; on the other hand, objective measures, such as grades and marks, provide standardized assessments but may not capture all aspects of learning, especially values and attitudes, and might not reflect students' motivation adequately. Furthermore, objective measures, are better suited for teacher-centered and theoretically oriented courses, but may not be ideal for student-centered and practically oriented approaches (Ismail et al., 2018). Thus, we recommend using both approaches to evaluate the students' final outcomes.

Third, more research is needed on entrepreneurial behaviors (Nabi et al., 2017; Pittaway & Cope, 2007) particularly on the transition from entrepreneurial intentions into entrepreneurial behaviors (thus, intention-behavior link) through longitudinal analysis, since the most important research challenge results to be in this area (Fayolle & Liñán, 2014). In this study sample, the articles that account both for entrepreneurial intentions and behavior are only 7 (i.e., Alakaleek et al., 2023; Gielnik et al., 2015; Rauch & Hulsink, 2015; Rippa et al., 2020; Shinnar et al., 2018; Souitaris et al., 2007; Zaryab &

Saeed, 2018), and those that account for intention-behavior link through longitudinal analyses are 6 out of 7 (i.e., Alakaleek et al., 2023; Gielnik et al., 2015; Rauch & Hulsink, 2015; Shinnar et al., 2018; Souitaris et al., 2007; Zaryab & Saeed, 2018). Indeed, Entrepreneurial Intentions with the Theory of Planned Behavior and cognitive outcomes dominate this area of research (Maheshwari et al., 2022; Nabi et al., 2017), but we still lack intention-behavior link studies.

Last, there is a need for studies that focus on abilities in non-task-related terms like: (i) (as anticipated) Big Five traits as a possible example of abilities non-task-related, such as conscientiousness, openness to experience/intellect, extraversion, agreeableness, and neuroticism/emotional stability; from this literature review, only 2 papers investigate all the Big Five dimensions (i.e., Alaref et al., 2020; Premand et al., 2016) and 1 that focuses only on openness (i.e., Ulvenblad et al., 2013); (ii) non-cognitive skills in non-task-related terms such as risk-taking propensity (i.e., Bandera et al., 2018; Huber et al., 2014; Oosterbeek et al., 2010), decision-making (i.e., Lackéus, 2020; Lackéus & Sävetun, 2019), persistence (i.e., Bandera et al., 2018; Ciptono et al., 2023; González-López et al., 2019; Huber et al., 2014; Morris et al., 2013; Oosterbeek et al., 2010), impulsiveness (i.e., Alaref et al., 2020; Premand et al., 2016); (iii) motivational aspects in non-task-related terms such as the need for power and power motivation (i.e., Alaref et al., 2020; Oosterbeek et al., 2010; Premand et al., 2016); need for autonomy and independence (i.e.,Oosterbeek et al., 2010; Volery et al., 2013), need for achievement and achievement motivation (i.e., Alaref et al., 2020; Florin et al., 2007; Huber et al., 2014; Lackéus, 2014; Oosterbeek et al., 2010; Premand et al., 2016; Volery et al., 2013) are currently overlooked, and particularly goal orientation, that it is currently not investigated in EE literature despite its importance in many life domains (Payne et al., 2007).

Indeed, for example, EE can foster also outcomes such as non-cognitive skills and abilities, defined as personality, social and emotional traits (Cunha et al., 2010) that are thought to underpin success in school, at work, and in many other domains (Heckman et al., 2006), which are not directly related to venture tasks (Marvel et al., 2016), and that could be shaped through education (Chen et al., 2020; Marvel et al., 2016). Also, motivational aspects are useful in many life domains; for example, motivation is an indispensable element needed for school success, because without it, students may not even make an effort to learn (Elliot et al., 2017), and one of the most crucial sources of

motivation is the individuals' desire to improve his/her own intellectual abilities (Dweck, 1986; Dweck et al., 1988; Elliot et al., 2017). Accordingly, motivation drives metacognitive skills, which, in a cyclical process, stimulate learning and thinking abilities, subsequently providing feedback to enhance one's level of expertise (Elliot et al., 2017). Thus, motivation can potentially impact emotional, behavioral, and cognitive aspects as the pursuit of competence evolves over time (Elliot et al., 2017) and this is not only useful for the entrepreneurial domain and venture creation.

Therefore, we strongly recommend considering a variety of non-cognitive skills (Chen et al., 2020; Cunha et al., 2010; Heckman et al., 2006), the Big Five traits of personality (Almlund et al., 2011), but also motivational aspects such as goal orientation (Payne et al., 2007) in future EE impact studies since the EE effect and assessment of the outcomes should move beyond venture creation (Alsos et al., 2023).

New contingencies. Considering possible contingencies, we confirm that there still is a requirement for further empirical studies that compare different pedagogical methods and teaching models (Nabi et al., 2017): our study recommends comparing different EE interventions and assessing their impact, not only in terms of the effect of different teaching models and pedagogical methods, such as Education about/for/through Entrepreneurship (Hannon, 2005) or Supply/Demand/Competence Models (Béchard & Grégoire, 2005), but also in terms of the different courses' contents. In the sample of articles considered in this SLR only 17 articles make a comparison between different courses: for example making a comparison of compulsory vs. elective courses (i.e., Hahn et al., 2020; Ripollés & Blesa, 2023; Warhuus et al., 2021) or a comparison between different courses' characteristics or pedagogies (i.e., Bohlayer & Gielnik, 2023; Debarliev et al., 2022; Hahn et al., 2017; Hockerts, 2018; Ismail et al., 2018; S. Mueller, 2011; Mukesh et al., 2020; Padilla-Angulo et al., 2022; Passaro et al., 2018; Piperopoulos & Dimov, 2015; Schultz, 2022; Sherkat & Chenari, 2022; Varamäki et al., 2015; Walter & Dohse, 2012; Warhuus et al., 2021), nevertheless, none of them take advantage of the teaching models' classification provided by Béchard & Grégoire (2005) or Hannon (2005) to make a comparison between different teaching models, as also suggested by Nabi et al. (2017). According also with the previous evidence, there is a need for studies that compare compulsory vs. elective interventions. Currently, only three articles (i.e., Hahn et al., 2020; Ripollés & Blesa, 2023; Warhuus et al., 2021) focus on this aspect

assessing their impact respectively on Entrepreneurial Self-Efficacy, Entrepreneurial Behaviors, and Team Behaviors and Processes; also, other types of outcomes should be considered in further analyses.

Furthermore, the review calls for additional studies that consider gender differences as EE can reach men and women differently (Shinnar et al., 2014), and the learning outcomes may differ by gender. In the sample of papers, 28 studies have developed a gender analysis: 14 considered gender as moderator (i.e., Bergman et al., 2011; Cadenas et al., 2020; Entrialgo & Iglesias, 2017; Feder & Niţu-Antonie, 2017; Ferreras-Garcia et al., 2022; Hassan et al., 2020, 2022; Nowiński et al., 2019; Pergelova et al., 2023; Ramadani et al., 2022; Shinnar et al., 2014, 2018; Wilson et al., 2007; Zhang et al., 2014), 9 studies analyzed the gender dimension splitting the sample into women and men (i.e., Blimpo & Pugatch, 2021; Florin et al., 2007; Johansen, 2013, 2017; Johansen & Foss, 2013; Jones et al., 2011; Oosterbeek et al., 2010; Packham et al., 2010; Padilla-Angulo et al., 2022), 3 articles used gender as the independent variable (i.e., Entrialgo & Iglesias, 2016; Schultz, 2022; van Ewijk & Belghiti-Mahut, 2019), and 2 articles used a sample of only women in their analysis (i.e., Bhatti et al., 2021; Shahin et al., 2021). Nevertheless, the body of knowledge on gender differences is still fragmented and overlooked; further analyses are needed to understand whether the impact of EE on a range of task-related and non-task-related outcomes differs by gender (Nabi et al., 2017).

Moreover, there are also other contextual contingencies that can be considered in further studies such as the role of enterprising family (i.e., Hahn et al., 2020), the role of the entrepreneurial climate and culture at the university (Bergmann et al., 2016), but also regional factors such as cultural, social, political, infrastructural, and financial contingencies (Bergmann et al., 2016; Stam, 2007).

Method and design. First, the majority of empirical studies are based on quantitative methods instead of qualitative or mixed methods (131 articles used quantitative methods, 15 qualitative methods, and 14 mixed methods). We strongly recommend using qualitative and mixed methods to study the impact of EE on outcomes for gaining a deep understanding of these types of outcomes that individuals can achieve after EE interventions.

Then, there is also a need to conduct experiments in the EE field (Longva & Foss, 2018) since there is a strong lack of robust experimental or quasi-experimental design studies to assess causality of EE effects more rigorously. Currently, 42 articles out of 160 (26%) declare to use experimental or quasi-experimental designs (i.e., Ahmed et al., 2017; Alaref et al., 2020; Armstrong, 2014; Åstebro & Hoos, 2021; Bergman et al., 2011; Bischoff et al., 2020; Blimpo & Pugatch, 2021; S. C. Chen et al., 2015; Costa et al., 2018; Debarliev et al., 2022; Elert et al., 2015; Fayolle & Gailly, 2015; Fretschner & Lampe, 2019; Fretschner & Weber, 2013; Gielnik et al., 2015, 2016, 2017; González-López et al., 2019; Hahn et al., 2020; Huber et al., 2014, 2020; Ismail et al., 2018; Izquierdo & Buelens, 2011; Johansen, 2013, 2017; Johansen & Foss, 2013; Karimi, Biemans, Lans, Aazami, et al., 2016; Karlsson & Moberg, 2013; Longva et al., 2020; Lyons & Zhang, 2018; Mentoor & Friedrich, 2007; Mukesh et al., 2020; Nabi et al., 2018; Oosterbeek et al., 2010; Otache et al., 2021; Premand et al., 2016; Rauch & Hulsink, 2015; Sánchez, 2011, 2013; Varamäki et al., 2015; Volery et al., 2013; von Graevenitz et al., 2010). Nevertheless, many of them have limitations, thus we suggest adopting similar designs such as those implemented by Gielnik et al. (2015, 2017) and Huber et al. (2014) for experimental designs, and Rauch & Hulsink (2015) and Volery et al. (2013) for quasi-experimental designs as best practice to follow.

Finally, considering the level of analysis, there is a need for study at the meso- and macro-level, not only the micro-level or individual level (Marvel et al., 2016), which currently is predominant (150 articles out of 160 conduct the analysis at the individual level). Studies on human capital have explored various levels of analysis, predominantly concentrating on the individual level; other levels of analysis encompass teams, firms, industries, regions, and countries (Marvel et al. 2016). However, other levels different from the individual level (micro level) have been investigated in a more limited way. Indeed, only 10 articles (i.e., Alaref et al., 2020; Chen & Agrawal, 2018; Harms, 2015; Huber et al., 2020; Hytti et al., 2010; Kotey, 2007; Laspita et al., 2023; Pazos et al., 2022; Walter & Dohse, 2012; Warhuus et al., 2021) develop analysis considering group/team-level dimension or at least multi-level (both individual- and group-level). Then, Walter & Dohse (2012) is the only one to consider the regional/organizational dimension and its impact on EE interventions and the subsequent effect on outcomes. Therefore, while the human capital construct is inherently well-suited for examination at the individual and

firm levels, there is a need for exploring data sources for more extensive macro-level research (Marvel et al., 2016).

New settings. Since different types of audiences in EE courses have different types of needs (Fayolle, 2013), we provide also further research directions considering the type of audience that followed EE courses and interventions considering the level and field of study.

First, considering the individuals' level of study, there is a need for studies in new settings and contexts and not only in higher education, for example: (i) primary school students: only 4 studies focused on a sample of pupils involved in primary school (i.e., García-Rodríguez et al., 2018; Huber et al., 2014, 2020; Lackéus & Sävetun, 2019); (ii) secondary school students: only 12 studies focused on a sample of students involved in secondary (i.e., Bergman et al., 2011; Blimpo & Pugatch, 2021; Johansen, 2013, 2017; Johansen & Foss, 2013; Marques et al., 2012; Otache, 2019a; Otache et al., 2021; Porfírio et al., 2023; Sánchez, 2013; Shahin et al., 2021; Volery et al., 2013); (iii) non-students: other contexts such as EE for non-students but for potential, nascent, or practicing entrepreneurs or in general adults; in the papers sampled in this literature review, there are no studies relating to this particular type of training program. Indeed, scholars who study these programs focus more on the startups' performances via firm-level analyses rather than on the aspect related to the impact of education at individual-level (Camuffo et al., 2020, 2021; Kotha et al., 2022; Novelli & Spina, 2022).

Accordingly, investing in early EE (such as in primary and secondary school students) could have an enduring impact on individuals' knowledge, skills, and abilities. This is because these investments not only directly influence current human capital assets but also generate spill-over effects in subsequent periods (Cunha & Heckman, 2007; Huber et al., 2014). Furthermore, exploring EE investments for adults, including non-students such as potential, nascent, or practicing entrepreneurs, could open an intriguing avenue for future research. While entrepreneurs or small-business owners could benefit from EE (Fayolle, 2013), our understanding of the implications of such audience diversity remains limited.

Then, considering the individuals' field of study, there is a need for research in other fields of study different from Business and Economics. A considerable number of studies analyzed the impact of EE in samples of students from multiple fields of study

(cross-disciplinary). However, in our sample, there is only one study carried out with students belonging only to the Social Sciences and Psychology area (i.e., Fernández-Pérez et al., 2019), underlining that EE is not widespread in all faculties and subject areas.

Last, considering the countries, there is a strong bias toward European contexts (79 articles out of 160). Moreover, only 5 articles perform their analysis using a sample of individuals from different countries (i.e., Hahn et al., 2017; Laspita et al., 2023; Shahab et al., 2019; Vanevenhoven & Liguori, 2013; Walter & Block, 2016).

2.5.2. Limitations

Our study presents two main limitations. First, we include in our sample a range of articles with different methodologies following the idea of Nabi et al. (2017) without specifically focusing on methodological rigor (Longva & Foss, 2018; Martin et al., 2013; Rideout & Gray, 2013). Indeed, the main objective of this study is to map human capital outcomes and their task-relatedness, and not the methodological designs of the empirical papers included in the final sample. The ultimate goal is to show as many areas as possible to provide future research directions. Nevertheless, we tried to overcome this problem by including only studies published in high-ranked journals or specific to the reference EE literature.

Considering the concept of task-relatedness, our review is based on a dichotomous approach. Nevertheless, this approach results to be limited and not able to individuate the nuances of EE outcomes. We recommend scholars employ measures that reflect more precise degrees of variance.

2.6. CONCLUSION

This literature review suggests an extension of the taxonomy provided by Marvel et al. (2016) considering the context of EE as a form of human capital investment and classifying EE outcomes into the categories of Knowledge, Skills, and Abilities. This literature review, to the best of our knowledge, represents the first exploration of the task-relatedness of EE outcomes offering several contributions. We add to the literature on EE by offering a critical systematization of the outcomes analyzed by EE impact studies and particularly their relatedness to venturing tasks; indeed, the first evidence reveals that while the concept of non-task-related outcomes is acknowledged in the EE literature, it is presently underemphasized.

The Chapter offers several avenues for future research, guiding – amongst the others – the development of the subsequent empirical articles in this dissertation.

The first direction pertains the type of final EE outcome and potential new dependent variables. In general, empirical evidence and theoretical development regarding the relationship between EE and non-task-related outcomes remain insufficient. This includes delving into personality traits such as motivational aspects as potential outcomes of EE.

To address this literature gap, Chapter 4 employs goal orientation (i.e., learning goal orientation, performance-approach goal orientation, and performance-avoid goal orientation) as dependent variable and final EE outcome. Goal orientation is defined as a personality characteristic that describes an individual's inclination to pursue different types of goal, with a specific focus on the non-task-related dimension since the goal orientation measurement in not directly related to the venture task. Through this, Chapter 4 aims to contribute to a deeper understanding of how EE influences individuals in areas beyond the immediate task-related context.

When it also comes to entrepreneurial behaviors, further research is required in understanding the transition from entrepreneurial intentions to actual entrepreneurial behaviors. Accordingly, Chapter 3 addresses this by employing entrepreneurial behavior as dependent variable, specifically considering the transition from intentions into behaviors.

A second direction that emerges from the systematic literature review is the need for studies that account for new possible contingencies. The article accounts for three main contingencies: (i) comparing and evaluating various EE interventions considering different pedagogies methods, contents, and teaching models, (ii) evaluating the effect of EE considering gender differences; (iii) exploring other contextual contingencies such as the role of enterprising family, the entrepreneurial climate and culture at the university, regional factors such as cultural, social, political, infrastructural, and financial contingencies.

Considering the first contingency, Chapter 2 investigates teaching models, referencing Béchard and Grégoire's (2005) framework that distinguishes between four different EE teaching models considering their theoretical and practical orientation (i.e., Supply, Supply-Demand, Demand, Demand-Competence and Competence Model);

Chapter 3 compares the effect of EE considering compulsory vs. elective interventions; and Chapter 4 assesses different contents taught during the EE interventions particularly considering the scientific and effectuation approach to decision-making.

Addressing the second contingency and the need to compare and evaluate whether EE reaches men and women differently on a range of outcomes, all subsequent chapters (Chapter 2, 3, and 4) consider gender differences specifically referring on how EE affects outcomes differently between men and women.

For the third contingency, Chapter 2 examines how the effect of EE on outcomes is contingent to the gender of self-employed parents (where existing) in order to assess how the prior exposure to entrepreneurship through an enterprising family affects the impact of EE on outcomes.

Another future direction that emerges from the systematic literature review is related to method and research design. Specifically, one literature gap is related to the lack of rigorous methodologies for the assessment of educational intervention (e.g., experiments and quasi-experiments). For this reason, Chapter 4 addresses this by employing a randomized control trial as a design to rigorously assess causality.

3. TEACHING MODELS AND LEARNING OUTCOMES IN ENTREPRENEURSHIP EDUCATION: THE ROLE OF STUDENTS' GENDER AND ENTERPRISING FAMILY

ABSTRACT

Entrepreneurship Education (EE) programs have grown rapidly within and across universities to provide students with the competencies necessary to handle the challenges of today's labor market and society. There are numerous ways to teach EE, and recent literature has discovered that different teaching models actually lead to different impacts and outcomes. However, it is yet unclear how such differences are related to the individuals' socio-demographic characteristics and how the social contexts in which students are embedded influence this relationship. This research contributes to the literature by investigating how the students' gender and the gender of self-employed parents (where existing) affect the outcomes of EE. Using a sample of 366 Italian students from 42 different courses in 16 universities that attended EE courses and answered the Italian GUESSS 2018, we find that being woman tends to reduce learning in general and, surprisingly, in more practice-oriented teaching models; we also find that such pattern is inverted (i.e., being a woman tends to increase learning, especially from practice-oriented teaching models) when women have *only* a self-employed mother *and not* a self-employed father.

Keywords:
Entrepreneurship Education; Teaching Models; Learning Outcomes; Gender; Parental Self-employment.

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The article "*Cascavilla, I., & Minola, T. (2022). Teaching models and learning outcomes in Entrepreneurship Education: the role of students' gender and enterprising family*" presented at the 8th ENTERYNG Workshop (2022) was derived from the dissertation and particularly this chapter (Chapter 2).
I would like to thank the participants of the workshop for their feedback and insightful comments.
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Specifically, this chapter represents the follow-up of a previous study published in the journal Administrative Sciences and attached in the appendix: Cascavilla, I., Hahn, D., & Minola, T. (2022). How You Teach Matters! An Exploratory Study on the Relationship between Teaching Models and Learning Outcomes in Entrepreneurship Education. *Administrative Sciences*, 12(1), 12.

3.1. INTRODUCTION

To equip students with the competencies needed to cope with the challenges of today's job market, Entrepreneurship Education (EE) programs have grown rapidly within and across universities, also in terms of heterogeneity and variety of courses' teaching models (Nabi et al., 2017). EE occupies a central role in the academic and policy debates (Eesley & Lee, 2021; Lackéus & Sävetun, 2019) as it is considered a possible method to increase the prevalence rate of entrepreneurs to stimulate economic growth (Rauch & Hulsink, 2015). Educational methods play an important role in the entrepreneurial learning process and impact (Bhatti et al., 2021; Camuffo et al., 2020). Indeed, depending on the goals, contents, and pedagogies, EE can be taught in a variety of ways (Béchard & Grégoire, 2005; Fayolle & Gailly, 2008; Naia et al., 2014); recent research has focused on how different approaches in EE interventions lead to different outcomes. For example, recent works have focused on the effect of teaching approaches on students' academic performances (Bosio & Origo, 2020), on the creation of academic spinoffs (Sansone et al., 2021), on entrepreneurial intention (Padilla-Angulo et al., 2021), and on entrepreneurial learning outcomes (Cascavilla et al., 2022).

Currently, very few studies examine the impact of different teaching models (Nabi et al., 2017), with Cascavilla et al. (2022) being the first attempt to focus specifically on students' entrepreneurial learning through an early-stage exploratory study: in fact, studies on entrepreneurial learning outcomes (LO)[10] and, in general, on learning processes remain underdeveloped (Markowska & Wiklund, 2020).

However, a better and more sophisticated understanding of the impact (Camuffo et al., 2020; Eesley & Lee, 2021) of different teaching models on LO in entrepreneurship is needed; for a comprehensive conceptualization of such relationship, it has been recommended to account for individuals' socio-demographic characteristics and study how they act as contingent dimensions (Nabi et al., 2017). In this respect, we advocated that students' gender (Martin et al., 2013; Padilla-Angulo et al., 2022), constitutes an interesting boundary condition that is worthwhile examining. Indeed, according to the Social Cognitive Theory (Bandura, 1989, 2011; Wood & Bandura, 1989), gender plays a crucial role in the individual's learning process: from one hand, Social Cognitive Theory

[10] "Learning outcomes" in entrepreneurship and "entrepreneurial learning" are to be considered synonyms of the concept of program learning identified by Souitaris et al. (2007).

emphasizes the role of self-efficacy beliefs in cognitive functioning and learning (Bandura, 1989; Lent et al., 1994), and how gender-related expectations and stereotypes can shape individuals' beliefs about their own abilities and competencies in certain domains (Lent et al., 1994; Wood & Bandura, 1989); on the other hand, the theory posits that individuals learn by observing and imitating others (Bandura, 1971), thus gender roles and stereotypes may influence the choice of role models and the behaviors that individuals are more likely to imitate (for example, individuals may be more inclined to imitate behaviors they associate with their own gender).

Furthermore, literature on education and learning argues that gender heterogeneity in career choices is partially due to how students learn (Severiens & Ten Dam, 1994): as there may be some differences in the way that women and men learn, also different educational experiences in the entrepreneurship field with different teaching models may play a role in the student's learning process.

Moreover, research has recently highlighted that exposure to an entrepreneurial family is a crucial contingency in studying the impact of EE on outcomes (i.e., Hahn et al., 2020); unfortunately, despite the recognition that intergenerational family dynamics are gendered in nature (Nelson & Constantinidis, 2017), literature has overlooked the combined effect of students and self-employed parents' gender (where existing) on the EE-LO relationship. Thus, we formulate the following research questions: (i) do men and women experience the effect of EE teaching models on their entrepreneurial LO attainment differently? (ii) if so, how does this relationship vary according to the gender of self-employed parents (where existing)?

To address such questions, we base our analysis on a cross-sectional sample of 366 Italian students that attended different EE courses and answered the Italian GUESSS 2018 (Global University Entrepreneurial Spirit Students' Survey) to offer an initial and exploratory attempt to conceptually extend the empirical exercise offered by Cascavilla et al. (2022): we first perform a moderation analysis (by means of student's gender) on the relationship between teaching model and entrepreneurial LO. Then, we observe the same moderated model on different sub-samples obtained considering the gender of the self-employed parents (where existing).

Our results confirm that teaching models matter in the learning process, but the way they matter actually depends on the individuals' characteristics, particularly the

gender of students and the gender of his/her self-employed parent(s). We find that, in general, women report lower levels of entrepreneurial LO when compared to men, and, surprisingly, this decrease is more pronounced in practice-oriented teaching models; we also find that such a pattern is inverted (i.e., women tend to have higher levels of entrepreneurial LO, especially from practice-oriented teaching models) when women have *only* a self-employed mother *and not* a self-employed father.

Drawing on Human Capital Theory (Becker, 1993), gender stereotypes (Heilman, 1983; Heilman et al., 2024), and Social Cognitive Theory (Bandura, 1989, 2011; Wood & Bandura, 1989) we interpret these findings, to offer a first exploratory study that combines the teaching model, students, and self-employed parent gender to advance the study of the impact of EE (Camuffo et al., 2020; Eesley & Lee, 2021). This represents a contribution to EE literature, by highlighting how boundary conditions derived from recent and lively scholarly debates in entrepreneurship research (i.e., gender and enterprising family) can inform EE theory and practice. After offering such theory-based discussion of the results, the paper offers a list of future research directions and practical implications.

3.2. LITERATURE REVIEW

3.2.1. Entrepreneurship Education and teaching models

Over the last few decades, EE has grown at a rapid rate among universities and all levels of education (Bae et al., 2014; Nabi et al., 2017; Pittaway & Cope, 2007; Rideout & Gray, 2013) capturing the attention of policymakers and university managers (Lackéus & Sävetun, 2019). This growth is visible not only in terms of number of EE courses and programs, but also in the variety of the audience, objectives, materials, contents, and pedagogical methods (Fayolle & Gailly, 2008; Fayolle & Lassas-Clerc, 2006); EE is taught among and across different faculties and universities to students with different socio-demographic characteristics and educational backgrounds (Blenker et al., 2012; Fayolle & Gailly, 2008). Related to such diversity, EE teaching models and pedagogies also differ widely within and among universities (Naia et al., 2014; Rauch & Hulsink, 2015). Indeed, EE may be pursued in a variety of ways, and there is no single best practice recognized as universally superior to all others; rather, multiple methods and approaches

with unique qualities and characteristics are used to achieve distinct goals and different outcomes (Fayolle & Gailly, 2008; Neck & Corbett, 2018).

In the EE literature, there are several classifications of teaching models and pedagogies, often based on their theoretical rather than practical orientation. A seminal classification is that of Hannon (2005) which distinguishes entrepreneurship courses in (i) education *about* entrepreneurship, which "is considered as an approach that emphasizes the study of entrepreneurship education as an academic study" (Hannon, 2005: pp. 108); (ii) education *for* entrepreneurship, which is considered an "approach [that] aims to prepare individuals for enacting an entrepreneurial life or immediate opportunity through the creation of a new business or venture" (Hannon, 2005: pp. 108); and (iii) education *through* entrepreneurship, which "suggests that entrepreneurship can be learned and/or taught through other subjects, as the core capabilities can be embedded within contexts other than just business or management" (Hannon, 2005: pp. 108).

Another well-recognized classification is that of Béchard & Grégoire (2005) which classify EE teaching models into three different main teaching approaches: (i) the Supply Model, which is mainly based on frontal lectures where learning represents the transfer of knowledge from the teacher (who plays a central role in the education process) to the students (seen as passive recipients of the content proposed); (ii) the Demand Model, which is mainly based on classroom experiences and personalized/participative methods through exploration, interactive searches, simulation, discussion and experimentation; students are seen as active participants and teachers as tutors and facilitators who guide the students during their learning path; (iii) the Competence Model, which is primarily based on tackling real-world problems or opportunities through consulting with outside experts and being challenged by active problem-solving; students are seen as responsible for their own learning while teachers serve as coaches and mentors who support students during their projects. Cascavilla et al. (2022) have argued and shown that the classification of the three teaching models from Béchard & Grégoire (2005) is in line with the previous classification from (Hannon, 2005). In particular, the Supply Model is in line with the "education *about* entrepreneurship" paradigm which aims at imparting to students knowledge about the entrepreneurship phenomenon (Heinonen & Hytti, 2010; Lackéus, 2015); the Demand Model is in line with the "education *for* entrepreneurship" paradigm which aims at shaping students'

entrepreneurial abilities and attitudes through practical activities and laboratories of idea generation and validation (Lackéus, 2015); and the Competence Model is in line with the "education *through* entrepreneurship" paradigm which prepares students to engage in entrepreneurial activities (Hannon, 2005; Lackéus, 2015). Furthermore, Béchard & Grégoire (2005) also introduce two hybrid models: (iv) the Supply-Demand Model, based on a mix of traditional lectures and classroom experiences; and (v) the Demand-Competence Model, based on a mix of classroom experiences and real-life problems to be solved.

Despite the conceptual merits of Béchard & Grégoire's (2005) classification of teaching models, EE scholars complain that still too little is known about the implications of teaching models on EE outcomes (Nabi et al., 2017; Naia et al., 2014), and only a few and recent research explorations (i.e., Cascavilla et al., 2022; Padilla-Angulo et al., 2021; Sansone et al., 2021) use this specific teaching models' classification of EE courses in the study of EE impact. However, after these initial attempts, what seems most urgent to fully understand the effect of teaching models is to take into account individual-level contingencies, such as the gender of students (Entrialgo & Iglesias, 2017; Nabi et al., 2017; Shinnar et al., 2014, 2018), a variable surprisingly not yet considered with this specific aim.

3.2.2. Entrepreneurship Education and learning: differences between women and men

Women entrepreneurs make an increasingly significant contribution to innovation, job, and wealth creation in economies across the globe (López-Delgado et al., 2019). Despite this growth, women's participation in the entrepreneurship field is still low (Piva & Rovelli, 2022; Santos et al., 2016). Literature has made an effort to explain these differences by trying to highlight possible antecedents: among others, perceived lack of support (Shinnar et al., 2012), fear of failure (Langowitz & Minniti, 2007; Noguera et al., 2013), self-perception (Dempsey & Jennings, 2014), social norms and gender stereotypes (Gupta et al., 2009; Laguía et al., 2019; Liñán et al., 2022).

Scholars agree that EE, as a specific human capital investment, could be one possible method to increase the rate of entrepreneurs, including women (Padilla-Angulo et al., 2022; Shinnar et al., 2018) as entrepreneurial training programs could generate

confidence in women's entrepreneurial capabilities through support and advice (López-Delgado et al., 2019).

Nevertheless, there exist gender differences in cognitive development (Ardila et al., 2011): for example, while women tend to achieve higher verbal skills, men have superior spatial and arithmetic skills. In addition, literature on traditional education (Holtbrugge & Mohr, 2010; Severiens & Ten Dam, 1994) anticipates that women and men tend to prefer different learning styles (i.e., women tend to prefer learning styles based on concrete experience and they are most interested in learning for learning's sake, while men prefer abstract conceptualization learning styles and they are more interested in the qualifications that the course offers). We suspect that such differences in the learning processes cannot be ignored in the case of EE. It is recognized that women and men benefit differently from EE interventions (Bergman et al., 2011; Shinnar et al., 2014), and learn differently the key human capital outcomes such as knowledge, skills, and abilities useful for pursuing an entrepreneurial career, but it is still not clear how they differently benefit from different teaching models. Accordingly, when failing to adopt gender-sensitive programs and learning methodologies, educational interventions consequently fail to raise students' entrepreneurial LO and dynamics (Haddad et al., 2016; Kautonen et al., 2015). Hence, it remains crucial to understand which are the educational teaching models that promote an egalitarian approach to entrepreneurship from a gender perspective.

In addition, during an entrepreneurship course, students may be exposed to the fact that entrepreneurial careers are male-biased and, consequently, men may perceive higher entrepreneurial interest (Roy et al., 2020) than women (Gupta et al., 2009; Langowitz & Minniti, 2007; Shinnar et al., 2014); this might impact attitudes and skills of women and men. All in all, gender seems to constitute a promising boundary condition that is worth analyzing, in order to gain a more nuanced understanding of the effects of EE.

3.2.3. The role of self-employed parents' gender

Scholars evaluating the impact of EE have recommended taking into account the students' social background in addition to, and together with, the course characteristics and students' demographics (Lyons & Zhang, 2018; Martin et al., 2013). Indeed, the family

environment in which students are embedded, via knowledge and support, can affect students' entrepreneurial inclination and learning (Bosma et al., 2012; Feder & Nițu-Antonie, 2017; Hahn et al., 2020). In particular, in their family, students might be exposed to role models that, during their own entrepreneurial journey might provide help to learn specific entrepreneurial tasks (Zozimo et al., 2017).

Role model exposure has been studied in the context of professional and career choices because they serve as a social reference point for students through a comparison of situations, emulations of behaviors, evaluation of abilities and motives, and so on. Role models are fundamental as a source of information and support (Barnir et al., 2011; Bosma et al., 2012; Laviolette et al., 2012): students can also acquire entrepreneurial capabilities and skills required for a successful entrepreneurial career through the observation of role models (Barnir et al., 2011); in fact, role modeling is an important nurture mechanism in the transfer of entrepreneurship (Lindquist et al., 2015) to provide learning, motivation, and inspiration but also support and guidance (Bosma et al., 2012). As such, alongside and together with the type of course, scholars assessing the impact of EE on key outcomes have been advised to consider in their studies the students' social background such as the exposure to an entrepreneurial family (Hahn et al., 2020). Considering the parental role model exposure, parents' gender is a key dimension (Nelson & Constantinidis, 2017); parental role models are frequently proposed as an explanation for why individuals select occupations since the influence of a parent could be stronger when the parent is of the same gender of the child (Dryler, 1998): for example, research shows that daughters with mothers involved as professional in the STEM field are more likely to engage in these male-dominated careers compared to daughters who do not have such a gendered parental exposure (Marx & Roman, 2002; Plasman et al., 2021; Stout et al., 2011).

The same can be observed in the entrepreneurial field. Past research highlights that parental exposure matters in stimulating entrepreneurial careers or entrepreneurial learning (Fayolle & Gailly, 2015; Hahn et al., 2017; Walter & Dohse, 2012) as one of the most powerful determinants of children's entrepreneurial choices is parental entrepreneurship (Lindquist et al., 2015); nevertheless here, whether parents' gender – especially if of the same gender as the children – plays a role in the offspring's entrepreneurial learning has been so far overlooked by research.

In sum, this exploratory study aims to gain a more nuanced understanding of the influence of gender in EE impact and specifically in the relationship between teaching models and entrepreneurial LO. First, we consider the gender of students as a contingency; second, we consider the student's prior exposure to an enterprising family, and specifically the effect of the gender of self-employed parent(s) (where existing).

3.3. METHOD

3.3.1. Research design

The empirical analysis of this study is based on the sample of Italian university students who took part in the 2018 Global University Entrepreneurial Spirit Students' Survey (GUESSS). Coordinated by the University of St. Gallen and the University of Bern in Switzerland, GUESSS consists of a global data collection effort, carried out every other year through an online survey; in Italy, the survey is coordinated by the Center for Young and Family Enterprise (CYFE) of the University of Bergamo. Students who responded to the survey were chosen through a non-random method in which universities determined the number of courses and schools whose students would receive the survey; students were contacted in a variety of simultaneous ways, including social media, email, and via direct invitation by their instructors in the classroom. In particular, the Italian data collection includes 7,299 respondents from 21 universities and has been checked for non-response bias through the data analysis of two different groups (early and late respondents) finding no statistically significant differences between the two groups. In the GUESSS consortium, each country has the opportunity to add few additional questions to the survey; indeed, for the Italian sample, some specific questions regarding EE courses that students had followed were asked (e.g., name of the EE course, the name of the professor who taught the course, type of the course, etc.).

This study relies on a cross-sectional empirical design examining the role of EE (and different types of teaching models) in strengthening the entrepreneurial LO, by unpacking such relationship through a moderation analysis via the gender of students and gender of self-employed parents (where existing).

We based our analysis on the dataset of Cascavilla et al. (2022); this dataset selects those students (386) who took EE courses. Thanks to the possibility of adding questions to the Italian version of the GUESSS survey, it has been possible to exactly identify the

specific EE course that each respondent has followed during his/her academic path. The whole process and implemented scheme of teaching models' classification are described in the Cascavilla et al. (2022) paper section named "Classification of the Teaching Models" (pp. 7); herein, we offer a brief summary.

The authors classified the teaching models of the courses attended by the respondents according to the five models defined by Béchard & Grégoire (2005): Supply, Demand, Competence, and two hybrids. The classification was done by analyzing the course descriptions (syllabus) on the university web pages, with two of the authors conducting an in-depth analysis of each course separately. In cases of disagreement, the authors discussed the coding with the third author and agreed on the final classification. The final classification was based both on the prevalence of specific keywords (proxying the specific teaching model of the courses), but also on the context in which such keywords were expressed. The authors provided a table adapted from Béchard & Grégoire (2005) that guided their classification process and an example of how they classified one specific course using such a procedure.

3.3.2. Sample

Starting from the sample of Cascavilla et al. (2022) and removing those observations with missing values for the variables of our interest, our resulting sample consists of 366[11] students who took 42 different EE courses from 16 Italian universities. The majority of courses based on a practice-oriented teaching model are elective courses, instead, most theory-oriented courses are mandatory for students (Table 13). Furthermore, most of the students followed an optional course rather than a compulsory one mainly based on the Demand-Competence Model. In fact, many of the students in the sample (128 out of 366; 35%) attended a C.Lab (Contamination Lab[12]), EE initiatives directly funded by the Italian Ministry of University and Research (MUR) with the aim of providing participants with the knowledge, skills, and abilities required for the development of entrepreneurial opportunities (Secundo et al., 2020). C.Labs mostly adopt practice-oriented teaching

[11] The resulting sample of 366 observations is different from the study sample of Cascavilla et al. (2022) resulting in 375 observations as new variables are inserted in our model and not all students answered the variables of our interest.

[12] Additional information is available at the following website: https://www.miur.gov.it/-/progetti-per-la-creazione-e-lo-sviluppo-dei-contamination-lab-e-del-clab-network (accessed on May the 4th 2023)

models (Fiore et al., 2019), and different external experts such as keynotes, lecturers, and speakers intervene during the whole path.

Table 13. Distribution of the number of courses and students by the type of course and teaching models.

	Elective		Compulsory		Total	
Teaching Models	*Courses*	*Students*	*Courses*	*Students*	*Courses*	*Students*
Supply	2	44	7	47	**9**	**91**
Supply-Demand	2	43	2	2	**4**	**45**
Demand	2	13	6	46	**8**	**59**
Demand-Competence	13	128	1	5	**14**	**133**
Competence	6	31	1	7	**7**	**38**
Total	**25**	**259**	**17**	**107**	**42**	**366**

Table 14 and Table 15 provide an overview of the distribution of the respondents among teaching models considering respectively if the students and the self-employed parents are men or women. The students in our sample are predominantly men (205 out of 366; 56%). Most of them (80 out of 205; 39%) have followed an EE course based on the Demand-Competence Model. On the contrary, most of the women (59 out of 161; 36.7%) have followed an EE course based on the Supply Model, followed by the Demand-Competence model with 53 women (32.9%).

Table 14. Distribution of respondents by teaching models and students' gender.

	Women	Men	Total
Teaching Models			
Supply	59	32	**91**
Supply-Demand	10	35	**45**
Demand	26	33	**59**
Demand-Competence	53	80	**133**
Competence	13	25	**38**
Total	**161**	**205**	**366**

The majority of the respondents does not have self-employed parents (224; 61.20%). About 40% of respondents (142 out of 366) have at least one parent that is self-employed: 25 respondents have a self-employed mother; 81 have a father, and 36 have both. Most of the students with self-employed parent(s) have participated in an EE course based on the Demand-Competence Model (Table 15).

Table 15. Distribution of respondents by teaching models and self-employed parents' gender.

	Self-employed Mother	Self-employed Father	Both Parents Self-employed	No Parents Self-employed	Total
Teaching Models					
Supply	7	20	9	55	**91**
Supply-Demand	4	10	6	25	**45**
Demand	3	13	1	42	**59**
Demand-Competence	8	31	16	78	**133**
Competence	3	7	4	24	**38**

Total	**25**	**81**	**36**	**224**	**366**

Table 16 represents the descriptive statistics and distribution of respondents across teaching models by self-employed parents' gender.

Table 16. Distribution of respondents by students and parent entrepreneurs' gender across teaching models.

Student →	*Women*				*Men*				
Parent →	*Father*	*Mother*	*Both*	*None*	*Father*	*Mother*	*Both*	*None*	**Total**
Teaching Models									
Supply	5	2	4	21	15	5	5	34	**91**
Supply-Demand	9	3	3	20	1	1	3	5	**45**
Demand	7	2	-	24	6	1	1	18	**59**
Demand- Competence	20	4	7	49	11	4	9	29	**133**
Competence	4	2	3	16	3	1	1	8	**38**
Total	**45**	**13**	**17**	**130**	**36**	**12**	**19**	**94**	**366**

3.3.3. Measures

Dependent variable. We measure entrepreneurial *Learning Outcomes (LO)* using the five-item 7-point Likert perceptual scale defined by Souitaris et al. (2007) that captures the entrepreneurial knowledge, attitudes, and skills that the students acquired through university offerings. The items of the scale are: (1) "increased my understanding of the attitudes, values, and motivation of entrepreneurs"; (2) "increased my understanding of the actions someone has to take to start a business"; (3) "enhanced my practical management skills to start a business"; (4) "enhanced my ability to develop networks" and (5) "enhanced my ability to identify an opportunity". The reliability of the scale was tested by computing Cronbach's alpha, which resulted above the recommended value of 0.7 (Nunnally, 1978). The scores of the five items were thus averaged to compute the dependent variable named LO.

Building on the concept of program learning identified by Souitaris et al. (2007) and previously conceptualized by Johannisson (1991), as indicated above, we refer to entrepreneurial LO as the process through which students develop entrepreneurial knowledge, skills, and abilities during an EE intervention. This conceptualization includes five dimensions of entrepreneurial learning from EE: know-why (entrepreneurial values and motivation), know-what (knowledge about what needs to be done to achieve entrepreneurial success), know-how (practical entrepreneurial abilities and skills), know-who (social and networking skills), and know-when (experience about when to take action). From an empirical standpoint, in our paper, this is implemented by means of the self-evaluated entrepreneurial LO, which the GUESSS survey borrows from Souitaris et

al. (2007). The approach of using self-evaluated entrepreneurial LO is well recognized in the entrepreneurship literature (Hahn et al., 2017; Hytti et al., 2010; Ismail et al., 2018; Nabi et al., 2018; Wang et al., 2019) and the measurement scale of Souitaris et al. (2007) has been validated (specifically, the authors show it is positively correlated with the grade for the EE course to which the subjective LO has been assessed supporting the validity of the learning measure).

We acknowledge that both subjective and objective measures have their advantages and disadvantages for assessing LO in an entrepreneurial course. Although subjective measures, such as individuals' self-evaluation, may be influenced by biases or personal motivations, they can provide insights into students' perceptions of their own learning, their confidence, and their attitudes toward entrepreneurship. On the other hand, objective measures can provide a standardized assessment, but may not capture the full range of LO, particularly those related to values and attitudes, and may not necessarily reflect students' motivation in the learning process.

Furthermore, objective measures, such as final grades, are better suited when assessing the outcomes of a teacher-centered course – such as a course based on the Supply Model – and might be less adequate when the course is student-centered (Ismail et al., 2018); thus, evaluating entrepreneurial LO based on grades could be misleading when evaluating the effects of more student-centered teaching models such as Demand-Competence or Competence Models.

In sum, the GUESSS measurement scale, based on individuals' self-evaluation of their own LO, beyond being legitimate, is particularly suitable to evaluate entrepreneurial human capital assets since it can detect all dimensions such as knowledge, skills, and abilities, and even more so in the study of different teaching models that need different forms of evaluation (Béchard & Grégoire, 2005).

Independent variables. We measure the teaching models associated with EE using four dummy variables, one for each teaching model, and using the Supply Model as the reference group. The variable takes 1 if the EE course belongs to the specific teaching model associated with the dummy and 0 otherwise. In particular, the four dummy variables are the following: (1) Supply-Demand, (2) Demand, (3) Demand-Competence, and (4) Competence. These four variables were built by using information collected from the previous work of Cascavilla et al., (2022).

Control variables. We control for a set of demographic and student-related variables, but also course-related features, in line with extant EE impact studies (e.g., Cascavilla et al., 2022)). Considering the student-related variables, we control for students' education level of study with a variable named *Undergraduate* equal to 1 for undergraduate students and 0 otherwise; for students' field of studies with a variable named *Business, Management, Economics (BME)* equal to 1 if the respondents belong to disciplinary areas related to management, business or economic and 0 otherwise; and for *Age*, measured in years, as it may affect the individual's propensity to learn (Hahn et al., 2020). Finally, considering the course-related variables we control for also the teachers' gender. Since the course could be taught by a woman, a man, or both men and women, we built two dummy variables: the dummy *Teachers (Women)*, equal to 1 if the respondent follows a course with a woman as a teacher and 0 otherwise; and the dummy *Teachers (both Women and Men)*, equal to 1 if the respondent follows a course with both women and men as teachers. We used the courses taught by men as the reference group in our control analysis.

Moderating variable. In the moderated model, the relationship between EE teaching models and entrepreneurial LO is conditional on students' gender using the traditional binary variable following the wake of other similar works (Padilla-Angulo et al., 2021; Shinnar et al., 2014, 2018). We examine the students' gender and in particular, we consider the variable named *Women* (equal to 1 if the respondent is female and 0 otherwise).

Sample split variable. As we were interested also in parental role modeling, we investigate how having (ii) a mother, (iii) a father, or (iv) both parents impacts the relationship. The question from the survey that captures this information about the self-employed parent(s) is the following: "Are your parents self-employed?". Students can answer the question indicating if they have a self-employed mother, a self-employed father, or both parents are self-employed. Hence, we repeat the same moderation analysis considering different sub-samples; we built here four different sub-samples considering the parents' gender. Since the respondents could have the mother as self-employed, the father, or both parents we repeat the regression model considering the sub-sample of women that have (i) a *Self-employed Mother*, (ii) a *Self-employed Father*, and (iii) *Both Parents Self-employed*.

3.4. RESULTS

The mean values, standard deviations, and statistical correlations are reported in Table 17, and Table 18 displays the descriptive statistics of the sample divided according to the teaching models. The means reported in Table 17 show that 25% of students took EE courses based on the Supply Model, 12% on Supply-Demand, 16% on Demand, 36% on Demand-Competence, and 10% on Competence Model. On average, the self-assessed entrepreneurial LO is equal to 4.55. 44% of students were women, almost two-thirds were undergraduates, and almost one-fourth studied in the business, management, and economics' field of study.

Almost one-third of the sample had at least one parent self-employed, of which 7% with a mother self-employed, 22% with a father self-employed, and 10% with both parents self-employed.

Table 17. Descriptive statistics and pairwise correlations.

Variables	Mean	St. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) LO	4.55	1.42	1														
(2) Supply	0.25	0.43	-0.13*	1													
(3) Supply-Demand	0.12	0.33	-0.07	-0.22*	1												
(4) Demand	0.16	0.37	0.04	-0.25*	-0.16*	1											
(5) Demand-Competence	0.36	0.48	0.13*	-0.43*	-0.28*	-0.33*	1										
(6) Competence	0.10	0.31	0.01	-0.20*	-0.13*	-0.15*	-0.26*	1									
(7) Women	0.44	0.50	0.01	0.24*	-0.16*	0.00	-0.06	-0.07	1								
(8) Teachers (Women)	0.17	0.38	-0.01	0.49*	0.05	-0.18*	-0.34*	0.01	0.22*	1							
(9) Teachers (both Women and Men)	0.56	0.50	0.03	-0.09	-0.42*	-0.45*	0.60*	0.18*	-0.04	-0.52*	1						
(10) Self-employed Mother	0.07	0.25	-0.12*	0.02	0.03	-0.03	-0.02	0.01	0.02	-0.09	0.07	1					
(11) Self-employed Father	0.22	0.42	0.09	-0.00	0.00	-0.00	0.02	-0.03	0.00	0.00	0.01	-0.14*	1				
(12) Both Parents Self-employed	0.10	0.30	-0.03	0.00	0.04	-0.12*	0.06	0.01	0.06	-0.03	0.07	-0.09	-0.18*	1			
(13) Undergraduate	0.66	0.47	-0.11*	0.12*	0.27*	-0.20*	0.02	-0.25*	0.09	0.01	-0.01	-0.03	0.04	0.06	1		
(14) BME	0.28	0.45	0.15*	0.03	-0.21*	-0.15*	0.21*	0.05	-0.04	0.11*	0.14*	-0.05	-0.01	-0.08	-0.14*	1	
(15) Age	23.11	3.91	0.10	-0.07	-0.23*	0.08	0.14*	0.04	-0.00	-0.09	0.14*	0.02	-0.01	-0.06	-0.19*	0.18*	1

*N = 366 observations. * $p < 0.05$.*

Table 18. Descriptive statistics by teaching models.

Variables	Supply Model (N =91)		Supply-Demand Model (N =45)		Demand Model (N =59)		Demand-Competence Model (N =133)		Competence Model (N =38)	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*	*Mean*	*St. Dev.*	*Mean*	*St. Dev.*	*Mean*	*St. Dev.*
LO	4.24	1.40	4.29	1.19	4.67	1.53	4.79	1.37	4.58	1.57
Women	0.65	0.48	0.22	0.42	0.44	0.50	0.40	0.49	0.34	0.48
Teachers (Women)	0.49	0.50	0.22	0.42	0.02	0.13	*No obs.*	*No obs.*	0.18	0.39
Teachers (both Women and Men)	0.48	0.50	*No obs.*	*No obs.*	0.05	0.22	0.95	0.21	0.82	0.39
Self-employed Mother	0.08	0.27	0.09	0.29	0.05	0.22	0.06	0.24	0.08	0.27
Self-employed Father	0.22	0.42	0.22	0.42	0.22	0.42	0.23	0.42	0.18	0.39
Both Parents Self-employed	0.10	0.30	0.13	0.34	0.02	0.13	0.12	0.33	0.11	0.31
Undergraduate	0.76	0.43	1	0	0.44	0.50	0.67	0.47	0.32	0.47
BME	0.30	0.46	0.02	0.15	0.12	0.33	0.40	0.49	0.34	0.48
Age	22.62	2.93	20.76	1.00	23.80	2.38	23.83	5.44	23.53	1.94

The tables below report the OLS regressions used to test the relationships (Cohen et al., 2003). The dependent variable has been standardized to facilitate the interpretation of the regression coefficients and standard errors were clustered by the university to cope with any correlation of errors at the university level following previous works whit individual-level observations (Cascavilla et al., 2022). To assess multicollinearity, we computed the variance inflation factors to quantify how inflated the variance is. All the VIF values remained below 10 (Kennedy, 2008), which indicates that multicollinearity is not a problem in these analyses.

Results are displayed in Table 19 (whole sample), and Table 20 (sub-samples). Model 1 displays only control variables, and the student field of study (*BME*) is positively associated with entrepreneurial LO. Model 2 introduces the independent variables, and the results of this first analysis (Table 19, Model 2) are in accordance with the previous research of Cascavilla et al. (2022): all the teaching models considered in the main regression show a positive impact on entrepreneurial LO as compared to the Supply Model. Except for the Supply-Demand Model, all the effects are statistically significant: these results indicate that students who attended EE courses based on the Demand ($\beta = 0.3976$, $p < 0.01$), Demand-Competence ($\beta = 0.4231$, $p < 0.05$), or Competence Model ($\beta = 0.2108$, $p < 0.1$) report higher levels of entrepreneurial LO compared to those who attended courses that used the Supply Model.

Then, we carried out the moderation analysis considering *Women* as moderator (Model 3a, 3b, 3c, 3d, 3e). It is observed that the coefficients of the interaction terms *Demand* x *Women*, *Demand-Competence* x *Women*, and *Competence* x *Women* are not statistically significant; the only coefficient statistically significant is the term *Supply-Demand* x *Women* ($\beta = -0.3858$, $p < 0.01$). With respect to the baseline model (Model 2), the situation drastically changes: even though the direct effects of the teaching models on entrepreneurial LO are positive, its interactions with women lead to negative results; in general, being a woman and following a course based on Supply-Demand, Demand-Competence, or Competence Model have a lower impact on entrepreneurial LO. Nevertheless, the only interaction term that achieves statistical significance is the one for those women that followed a course based on the Supply-Demand Model, even though the direct effect of the Supply-Demand Model was the only one not statistically significant in Model 2.

Then, we carried out the moderation analysis on the split four sub-samples mentioned above (Table 20): (i) the self-employed mother (Model 4a, number of observations equal to 25), (ii) the self-employed father (Model 4b, number of observations equal to 81), (iii) both parents self-employed (Model 4c, number of observations equal to 36).

Model 4a shows that for those students with a mother self-employed, being a woman and following a course based on Supply-Demand, Demand, and Demand-Competence Models is positively related to entrepreneurial LO with respect to men; instead, following a course based on Competence Model is negatively related to entrepreneurial LO. Nevertheless, the only interaction term statistically significant is *Demand* x *Women* ($\beta = 2.4791$, $p < 0.01$).

On the contrary, for those students with a father self-employed (Model 4b), being a woman and following any type of EE courses is negatively related to entrepreneurial LO. The interaction terms statistically significant are *Supply-Demand* x *Women* ($\beta = -1.3272$, $p < 0.01$), *Demand-Competence* x *Women* ($\beta = -0.4139$, $p < 0.1$), and *Competence* x *Women* ($\beta = -1.8749$, $p < 0.05$). Model 4c, which tests the moderation analysis for those students with both parents self-employed, shows that all the interaction terms are not statistically significant[13].

[13] A chi-square test reveals that students' gender is not fully exogenous and somewhat related to the types of teaching models of EE. Hence, our results should be interpreted with caution, as the well-known selection problem in EE research might be in place.

Table 19. Main regression analyses with LO as the dependent variable considering the whole sample.

Variables	**Model 1**	**Model 2**	**Model 3a**	**Model 3b**	**Model 3c**	**Model 3d**	**Model 3e**
Teachers (Women)	-0.0753	0.1977**	0.2220***	0.1983**	0.1518*	0.1688**	0.2291***
	(0.0795)	(0.0704)	(0.0622)	(0.0712)	(0.0864)	(0.0695)	(0.0675)
Teachers (both Women and Men)	-0.0241	0.0167	0.0497	0.0076	0.0010	0.0046	0.0424
	(0.1250)	(0.1132)	(0.1248)	(0.1140)	(0.1058)	(0.1130)	(0.1325)
Undergraduate	-0.1672	-0.1314	-0.1446	-0.1331	-0.1460	-0.1402	-0.1406
	(0.1323)	(0.1327)	(0.1312)	(0.1310)	(0.1357)	(0.1350)	(0.1359)
BME	0.3073**	0.2699*	0.2767**	0.2680**	0.2707**	0.2784**	0.2655**
	(0.1087)	(0.1269)	(0.1227)	(0.1193)	(0.1105)	(0.1211)	(0.1136)
Age	0.0148	0.0116	0.0113	0.0122	0.0120	0.0114	0.0122
	(0.0137)	(0.0130)	(0.0126)	(0.0126)	(0.0136)	(0.0131)	(0.0130)
Supply-Demand		0.2210	0.4436***	0.1910	0.3924***	0.3945***	0.2849*
		(0.1274)	(0.0964)	(0.2024)	(0.1120)	(0.1141)	(0.1425)
Demand		0.3976***	0.3803**	0.2149*	0.2639*	0.2462*	0.3686*
		(0.1117)	(0.1390)	(0.1187)	(0.1328)	(0.1232)	(0.1787)
Demand-Competence		0.4231**	0.4454**	0.4252**	0.5017***	0.4335**	0.4952***
		(0.1854)	(0.1859)	(0.1899)	(0.0977)	(0.1964)	(0.1245)
Competence		0.2108*	0.2351**	0.2107	0.2370**	0.2444	0.2605
		(0.1165)	(0.1088)	(0.1207)	(0.1030)	(0.1935)	(0.1720)
Women			0.1094	-0.0067	0.1372	0.0818	0.0963
			(0.0888)	(0.1064)	(0.1225)	(0.0739)	(0.1537)
Supply-Demand x Women			-0.3858***				-0.3754*
			(0.1076)				(0.1777)
Demand x Women				0.4537			0.3503
				(0.3085)			(0.2255)
Demand-Competence x Women					-0.1544		-0.1151
					(0.2869)		(0.3280)
Competence x Women						-0.0514	-0.0685
						(0.2833)	(0.2696)
Constant	-0.2904	-0.5660	-0.6497*	-0.5696	-0.6238	-0.5902	-0.6625
	(0.4053)	(0.3541)	(0.3605)	(0.3357)	(0.3864)	(0.3461)	(0.4066)
Observations	366	366	366	366	366	366	366
R-squared	0.0356	0.0560	0.0600	0.0640	0.0585	0.0573	0.0661

Supply Model as the reference group. Number of groups = 16 universities. Omitted = omitted observations (multicollinearity issues or no observations available). Robust standard errors in brackets,
**** p < 0.01, ** p < 0.05, * p < 0.1*

Table 20. Main regression analyses with LO as the dependent variable considering the sub-samples. (Model 4a = only students with a self-employed mother; Model 4b = only students with a self-employed father; Model 4c = only students with both parents self-employed).

Variables	Model 4a (Mother)	Model 4b (Father)	Model 4c (Both)
Teachers (Women)	1.5281	0.5890***	0.3369
	(1.1597)	(0.1588)	(0.2129)
Teachers (both Women and Men)	0.5540	1.2760***	-1.0454***
	(0.3564)	(0.1900)	(0.2627)
Undergraduate	0.1224	-0.1549	-0.1053
	(0.8444)	(0.3554)	(0.4198)
BME	0.0499	0.1184	1.2596**
	(1.3195)	(0.1532)	(0.4160)
Age	-0.2111	0.0216	-0.1355
	(0.1715)	(0.0281)	(0.1219)
Supply-Demand	*omitted*	1.1395***	0.0962
		(0.1313)	(0.4370)
Demand	-0.6886	1.9753***	1.4753**
	(0.7415)	(0.2999)	(0.4634)
Demand-Competence	0.2841	0.7741***	1.7979***
	(0.5859)	(0.1507)	(0.3919)
Competence	-0.0356	0.7581**	3.0205***
	(2.1040)	(0.2531)	(0.6791)
Women	0.0924	0.7307***	0.7306**
	(0.4888)	(0.0886)	(0.2876)
Supply-Demand x Women	0.3304	-1.3272***	-0.0898
	(0.5705)	(0.1067)	(0.2959)
Demand x Women	2.4791***	-0.0728	*omitted*
	(0.6859)	(0.1910)	
Demand-Competence x Women	0.7723	-0.4139*	-0.0185
	(0.7332)	(0.2117)	(0.8065)
Competence x Women	-0.6111	-1.8749**	-0.0718
	(2.2121)	(0.7656)	(1.0748)
Constant	3.7097	-2.0761**	1.9053
	(4.0606)	(0.7277)	(2.6784)
Observations	25	81	36
R-squared	0.3607	0.2901	0.5031

Supply Model as the reference group. Number of groups = 16 universities. Omitted = omitted observations (multicollinearity issues or no observations available). Robust standard errors in brackets,
**** p < 0.01, ** p < 0.05, * p < 0.1*

The summary of the results is reported in Table 21.

Table 21. Summary of findings.

Sample:	**All students**	**All students**	**Students with a mother self-employed**	**Students with a father self-employed**	**Students with both parents self-employed**
Model:	**Direct effect**		**Marginal effect of being a woman**		
Supply-Demand	+	-***	+	-***	-
Demand	+***	+	+***	-	*Omitted*
Demand-Competence	+**	-	+	-*	-
Competence	+*	-	-	-**	-

Omitted = omitted observations (multicollinearity issues or no observations available).

3.5. DISCUSSION

Our research responds to recent calls from scholars to consider the teaching model adopted in EE courses in assessing their impact by exploring contextual reasons such as

individual socio-demographic characteristics and examining if the impact of EE interventions is gender-specific (Nabi et al., 2017). In this respect, the paper examines the boundary conditions in the approach-outcome relationship, highlighting that the association between teaching models and entrepreneurial LO can be understood to a greater extent by considering the EE audience and in particular (i) students' gender, and (ii) self-employed parents' gender. Through the moderation analyses, our findings show that the teaching models have different impacts on the entrepreneurial LO achieved by men and women and that the gender of self-employed parents influences this moderated relationship.

Looking first at the direct effects, all considered teaching models have a significant and positive marginal effect on entrepreneurial LO compared to the most theoretically oriented one (Supply Model), as already highlighted by Cascavilla et al. (2022). Then, nuances emerge when the moderating effect of gender is considered in the model: women achieve less benefits from Supply-Demand, Demand-Competence, or Competence teaching models as compared to men (yet, the only statistically significant is the former; the only case where women achieve more benefits is the Demand Model, but the effect is not statistically significant either). Finally, when we also consider the impact of the gender of self-employed parents, findings show that having a self-employed mother leads to a positive marginal effect of being a woman for those that followed a Supply-Demand, Demand, or Demand-Competence course (yet, the only statistically significant result is for those students that followed a course based on the Demand Model). The opposite occurs in the presence of a self-employed father: for women, having a self-employed father limits their entrepreneurial LO in courses based on Supply-Demand, Demand-Competence, or Competence Model. All in all, our results show that being a woman tends to reduce learning in general and, surprisingly, in more practice-oriented teaching models; we also find that such pattern is inverted (i.e., being a woman tends to increase learning, especially from practice-oriented teaching models) when women have *only* a self-employed mother *and not* a self-employed father.

3.5.1. Contributions to theory and research

To take advantage of these exploratory findings in moving some preliminary steps towards a gendered and contextualized view of the relationship between teaching model

and entrepreneurial LO, in the following we dare to interpret them based on established theories from entrepreneurship research. As the first analyses involve the direct impact of teaching models on entrepreneurial LO, we rely on Human Capital Theory (Becker, 1993; Marvel et al., 2016) to explain the impact of different teaching models on entrepreneurial LO; then, to discuss the differences among women and men in their cognitive process we rely on leaning style differences (Holtbrugge & Mohr, 2010; Severiens & Ten Dam, 1994) and gender stereotypes theory (Heilman, 1983; Heilman et al., 2024); last, to discuss the effect of the exposure to role models in entrepreneurial families we rely on Social Cognitive Theory (Bandura, 1989, 2011; Wood & Bandura, 1989).

Integrating teaching models and learning outcomes: a human capital perspective. First, this study illustrates that various teaching models are linked to different levels of entrepreneurial LO, supporting the idea that how entrepreneurship is taught plays a crucial role in the effectiveness of EE. While Cascavilla et al. (2022) have offered an empirical exercise aimed at providing a method to classify teaching models, here we take the opportunity to conceptualize on the findings and pave the ground for the interpretation of gendered and parental effects as boundary conditions in the teaching model-LO relationship. Human Capital Theory offers a valuable lens to interpret these results. Human Capital Theory (cf. Becker, 1993) has become widespread in entrepreneurship research, and specifically in the study of how universities with their educational interventions play a key role in developing qualified human capital (Martin et al., 2013). Indeed, the study of Human Capital Theory began with an emphasis on the economic value of education and the understanding that individuals possess unique knowledge, skills, and abilities that contribute to economic growth (Dutta & Sobel, 2018). Furthermore, this theory has been frequently utilized within the field of entrepreneurship, consistently demonstrating a correlation between human capital attributes and entrepreneurial success (Unger et al., 2011). In particular, EE interventions, considered specific investments in human capital, contribute to the development of students' entrepreneurial knowledge, strengthening their entrepreneurial traits, skills, attitudes, and intentions (Bae et al., 2014; Martin et al., 2013), and lead to students that are better equipped to identify and pursue opportunities and being more motivated to take action upon them (Politis, 2005; Souitaris et al., 2007).

In line with this, the conceptual framework developed by Marvel et al. (2016) on human capital in entrepreneurship research suggests that it is possible to distinguish between three different types of investments in human capital (i.e., education, training/experience, and recruitment). Specifically, (i) *education* represents an investment in formal education (such as attending school and university) and in learning activities in order to impart students with explicit knowledge, understand principles and processes. The key knowledge and information are here imparted from the institution/university to the recipients. Indeed, the most important keyword here is *imparting* as a mechanism to transfer knowledge through education; (ii) *training/experience* represents an investment in job-specific training and experience mostly in developing skills through learning by doing activities (such as job-specific training programs and work experience). Here, the practical skills are developed through experience in the field and the key concept is to *develop* skills to create solutions to problems; (iii) *recruitment* represents an investment in the recruitment process mostly in order to acquire external key individuals with abilities useful for the entrepreneurial field. Here, the abilities are acquired through investments in team members, alliances, and organizations (the keyword is *acquiring*).

This distinction is particularly interesting if we consider the different EE teaching models; while all EE courses as educational interventions represent a specific investment in human capital (i.e., education), the peculiarities of different teaching models may incorporate the nuances of, and resonate with, the other types of investments in human capital. Under this view, we advance it is possible to integrate the conceptual framework of Béchard & Grégoire (2005) on EE teaching models with the Human Capital Theory in entrepreneurship research (Marvel et al., 2016) to interpret our findings.

The Supply Model, which is the most theory-oriented and based on the transfer of information, knowledge, and theoretical concepts from the teacher to the students, can help to develop individuals' cognitive human capital by providing them with knowledge and understanding of entrepreneurship concepts; it does not emphasize learning-by-doing activities (training/experience), nor the recruitment of key individuals such as the consulting of external experts (recruitment).

On the other extreme, the Competence Model, which is the most practice-oriented, is based on dealing with real-world problems through both learning-by-doing activities (training/experience) and recruitment also of external speakers, experts, and young

entrepreneurs (*recruitment*). Particularly, activities with external influential people are important for the students' learning process because students view them as credible, competent, and trustworthy people who operate directly in the field (Padilla-Angulo et al., 2022). Then, the Demand Model is the model in-between, combining both theoretical and practical approaches through experiential programs and participative methods (training/experience) in a simulated environment. The recruitment of experts here happens only marginally and teachers are facilitators rather than experienced professionals or entrepreneurs (Padilla-Angulo et al., 2022). Last, the two hybrid models (Supply-Demand and Demand-Competence) combine the characteristics of the pure models mentioned above also in terms of learning by doing activities and recruitment of external experts. The summary of the conceptual approaches and arguments illustrated above is reported in Table 22 (limiting to "pure" models).

Table 22. Summary and comparison of Human Capital Theory construct and EE teaching models.

	Model	**Education *about* Entrepreneurship**	**Education *for* entrepreneurship**	**Education *through* entrepreneurship**
Hannon (2005)	*Definition*	A paradigm that attempts to teach students about the concept of entrepreneurship from a content-laden and theoretical perspective.	A paradigm that attempts to use hands-on exercises and labs for idea generation and validation in order to develop students' entrepreneurial practical skills.	A paradigm that attempts to prepare students to engage in entrepreneurial activities through an experiential learning process focusing on fostering entrepreneurial mindset and attitudes.
	Model	**Supply**	**Demand**	**Competence**
Bèchard and Grégoire (2005)	*Definition*	A model with the aim of imparting information and knowledge about the entrepreneurship phenomenon. Education is thus centered on what the teacher knows.	A model with the aim of developing skills using experiential and participative methods such as exploration, simulation, and discussion. Education is thus centered on what student needs.	A model with the aim of acquiring knowledge, skills, and abilities through practical ways and also involving external experts and dealing with real-world problems. Education is thus centered on the interactions between context, teacher, and students.
	Model	**Education**	**Training/experience**	**Recruitment**
Marvel et al. (2016)	*Definition*	An investment in learning activities primarily aimed at imparting to students explicit knowledge and comprehending concepts and processes.	An investment in developing practical skills through a learning-by-doing experience.	An investment mostly in order to acquire abilities through the intervention of external individuals and experts in the field.

Overall, both theory and practice-oriented teaching models in EE can contribute to the development of human capital, by providing students with the knowledge, skills,

and abilities (Marvel et al., 2016) necessary to be more productive in the workforce and to be more successful in entrepreneurship; but above all, why do different teaching models lead to developing different entrepreneurial LO? Both the Demand and Competence models seem better equipped than the Supply Model, which turns out to be the least effective in yielding high level of entrepreneurial LO. Based on the above, a certain pattern can be identified: investments in human capital that complement education with learning by doing activities (Demand) and even more so if they include the recruitment of entrepreneurial experts who intervene during the course (Competence) impact entrepreneurial LO more strongly than that which does not, focusing only on imparting of knowledge from teachers to students (Supply).

Students' gender as a boundary condition: a gender-stereotypes perspective. As a second contribution, this study shows that the effects of teaching models are somewhat different between women and men, a thing that should induce caution when generalizing the positive effect of EE (Nabi et al., 2017; Rauch & Hulsink, 2015). Women achieve less benefit from Supply-Demand Model in comparison to men.

Past studies highlight that individuals' gender may have a significant impact on human cognitive functions: women and men have different ways to encode memories, sense emotions, solve specific problems, and make decisions as they have different brain structures (Xin et al., 2019); these gender-related functional differences may be attributed to the gender-specific cognitive processes (Xin et al., 2019). More specifically, the literature highlights that there are gender differences in learning styles and ways in which women and men develop cognitive processes. According to Severiens & Ten Dam (1994), women tend to prefer concrete learning styles through a specific involvement in experiences and feelings, while men are more likely to begin learning with abstract concepts and through theorization about the experience, using logic and concepts. Holtbrugge & Mohr (2010) underline that women prefer active experimentation and practical applications in their learning process and that they prefer doing rather than observing, instead, men are more reflective and more interested in theories than in practical applications.

However, and surprisingly, our findings suggest that woman achieve lower levels of LO in more practice-oriented teaching models (e.g., Supply-Demand Model compared to Supply Model). A possible explanation can come by drawing on gender stereotypes

literature; it is recognized that, currently, the EE courses taught in Italian universities might still be somewhat biased, and targeted towards men, whatever the type of teaching model used. Gender stereotypes play a role in shaping individuals' entrepreneurial attitudes and perceived levels of abilities, and entrepreneurship is still rather recognized as a masculine career path (Padilla-Angulo et al., 2022; Westhead & Solesvik, 2016). As exposure to role models is crucial for the formulation of an entrepreneurial identity (Elliott et al., 2021) and could help overcome gender stereotypes in the entrepreneurship field, women as teachers or mentors (Padilla-Angulo et al., 2022) and as external speakers (Elliott et al., 2021) have a significant impact on how women perceive the entrepreneurial career as an attractive choice and they can also influence the learning process. As said, in the Italian reference context, women (teachers) that taught EE courses are underrepresented; in our sample, for example, only 8 courses out of 42 are taught by a woman. This bias, in sum, might be the cause of a relative ineffectiveness of practice-oriented teaching models with women. While we could not directly test whether this is the case, by measuring the exact level of masculinity or gender stereotypes in the courses we analyzed, the one offered above seems a coherent and credible way to assess our gender-specific findings and guide future research.

Self-employed parents' gender as a boundary condition: a social cognitive perspective. Finally, this study highlights that also the role of the gender of self-employed parents matters in the way women and men differently achieve entrepreneurial LO. According to Social Cognitive Theory (Bandura, 1989, 2011; Wood & Bandura, 1989), individuals tend to observe and imitate same-gender models more than opposite-gender models and they are more likely to adopt behaviors that are consistent with gender stereotypes (Heilman, 1983; Heilman et al., 2024). By taking into account the role of the entrepreneurial family, our results offer preliminary evidence of the dynamics through which such exposure affects the outcomes. Being a woman (man) leads to higher levels of entrepreneurial LO in the presence of a self-employed mother (father); conversely, being a woman (man) leads to lower levels of entrepreneurial LO in the presence of a self-employed father (mother), with or without a self-employed mother (father). One possible explanation is that the self-employed mother represents a positive role model for women, unlike the self-employed father; having such same-gender role model should help women in mitigating gender stereotypes (Elliott et al., 2021). Our results overall imply

that *gender affinity* between the students and the self-employed parent(s) is at work and is necessary to benefit from EE: for both women and men, having a parent of the same gender who is involved in entrepreneurial activities helps students to obtain higher levels of entrepreneurial LO.

When focusing on the teaching models specifically, women with a self-employed mother obtain higher levels of entrepreneurial LO than men, particularly when they follow courses based on the Demand Model, as compared to Supply Model. Women with a self-employed father obtain lower levels of entrepreneurial LO than men virtually with all models, as compared to the Supply Model. A similar pattern can be observed for women with both parents that are self-employed.

This means that having a self-employed mother mitigates the negative effect of EE on women's entrepreneurial LO, particularly from practice-oriented courses. Building on the arguments above, this could be interpreted as a positive role-modeling effect (of having a mother self-employed) that counterbalances the gender stereotype which we assumed as a possible cause of the ineffectiveness of practice-oriented teaching models with women. Again, the one offered here seems a coherent and credible way to assess our gender-specific contextualized findings and guide future research.

3.5.2. Limitations and future research

This research has some limitations that lead to opportunities for future research. First, this exploratory study finds an association between teaching models and entrepreneurial LO considering the gender of respondents, and the gender of self-employed parents through a cross-sectional study. We recommend scholars to also embrace other empirical approaches such as longitudinal experimental or quasi-experimental methods with pre- and post-investigations, to assess causality more rigorously; but also qualitative investigations to better understand which are the dynamics and particularly the reasons why women compared to men show lower levels of entrepreneurial LO in practice-oriented teaching models.

Second, as this investigation relies only on the Italian context, which impacts the interpretation of the generalizability of our results, we suggest replicating this approach also in other different cultural and academic contexts, different social ecosystems, and across different countries as, according to the Social Role Theory (Eagly, 1987; Eagly et

al., 2000; Eagly & Wood, 2011) and gender stereotypes (Heilman, 1983; Heilman et al., 2024), beliefs about men and women and their gender roles reflect the society and culture of reference. Moreover, as individuals are the product of their cultural background and the learning style preferences and processes could depend on it (Holtbrugge & Mohr, 2010), also further investigations aimed to understand the differences across regions within the same country can be interesting.

Third, also the variables related to the teaching models and the exposure to an entrepreneurial family are measured through dichotomous variables which could represent a limitation; using a more in-depth analysis of the type of teaching model beyond a dichotomous classification or, in the case of exposure to an entrepreneurial family, which allows students to evaluate the business of the mother/father/both parents as successful or not, would have the potential to better illustrate the EE impact on entrepreneurial LO.

Fourth, the main limitation of this study is the fact that observations are not distributed homogeneously; indeed, the distribution of students in the various courses considering the different teaching models is different from each other. Future research could replicate this study with a more evenly distributed sample both in terms of the number of students who attended courses with different teaching models, both in terms of the number of women and men, and in terms of students who have mothers, fathers, both parents, or no parents self-employed.

Fifth, it has been not available to determine how much time elapsed between the conclusion of the EE course and the respondents' assessment of their entrepreneurial LO as the GUESSS survey was not distributed at the end of each single course; in fact, it was distributed simultaneously at global level. Despite the GUESSS survey has the significant benefit of ensuring accuracy in the causal relationship between EE and entrepreneurial LO (respondents expressly attribute their LO rating to the EE interventions; cf. Hahn et al., 2017), future research could try to observe students right after the EE course.

Sixth, future research could also focus on other EE outcomes (such as entrepreneurial knowledge, skills, abilities, attitudes but also career intention or entrepreneurial behaviors and performances) and assess the impact of different teaching models and how the results differ between women and men. Furthermore, although we believe that an objective measurement scale (such as student grades) would not be

adequate for the purpose of this study, we believe that a measure of LO based only on self-evaluation may not be sufficient to evaluate the impact of different teaching models. Future studies could use different evaluation methodologies such as diaries or reflective essays to examine how and what students learn (Ismail et al., 2018).

Finally, another interesting analysis not developed in this study is to detect gender stereotypes also in course programs as typically, like Elliott et al. (2021) suggest, syllabi language is primarily masculine, and it may be helpful to understand which terms and content can be changed or deleted to achieve more gender-inclusive contents in EE courses' syllabi.

3.5.3. Contributions to practice

Our findings reinforce the idea that not only how entrepreneurship is taught matters for the impact produced by EE on students, but also the gender of both students and self-employed parents does matter. Particularly, we highlight that the selection of the pedagogy and teaching models for EE courses should rely upon their adequacy regarding the audience characteristics as EE courses involve students with a different range of socio-demographic characteristics, aspirations, and levels of involvement in the entrepreneurial process (Fayolle & Gailly, 2008).

Building on our results, instructors and course designers may derive the awareness of underlying pedagogical mechanisms that result from different teaching models and their different impacts on different types of students. Even when the course design has been done, it is important to introduce an appraisal of the class that allows to understand whether additional modules or elective labs could be needed (particularly for women).
EE could be one possible mechanism or tool to increase the prevalence rate of students in the entrepreneurial field. Indeed, entrepreneurship courses could generate confidence in students' entrepreneurial capabilities through support and advice during the learning process. As differences between women and men in how they achieve specific entrepreneurial LO exist, designing a better configuration of an EE course could lead to a better learning experience also for women. Consequently, the positive impact of different teaching models on entrepreneurial LO also for women could in turn lead to improved cognitive skills useful for recognizing and acting on entrepreneurial

opportunities and enhancing their willingness and capabilities to found their own business.

3.6. CONCLUSION

The growth of EE programs in universities has grown rapidly to equip students with the knowledge and skills they need to succeed in today's job market. Past research has shown that there are different ways to teach EE and that actually different teaching methods lead to varying results. However, it is unclear how students' socio-demographic characteristics impact this relationship. In this study, we examined the effect of students' gender and the gender of their self-employed parents (where existing) as contingencies in the relationship between teaching models and entrepreneurial LO. Our study sheds light on the impact of both the students' gender and the gender of self-employed parents on the learning process in EE, contributing to the fields of entrepreneurship research, EE research, and practice highlighting the significance of considering gender in EE and especially in studies evaluating its impact.

4. WHY DO WOMEN (NOT) BECOME ENTREPRENEURS? THE ROLE OF STUDENTS' COGNITIVE PROCESSES

ABSTRACT

Entrepreneurship is one of the most powerful economic forces in modern societies, but women are less likely than men to engage in start-up activities and the causes of this gap are still not entirely clear. Building on the Theory of Planned Behavior (TPB), we propose that being a woman affects entrepreneurial behavior and we claim that this relationship is double serially mediated by cognitive factors (such as entrepreneurial attitude, subjective norms, locus of control, and self-efficacy) and entrepreneurial intentions.

By using a longitudinal sample of university students over two years (GUESSS project 2016-2018) and fully testing the TPB, results show that being a woman is significantly and negatively related to entrepreneurial behavior, that there is a significant and negative relationship between being a woman and both attitude and intention, and that the relationship between being a woman and entrepreneurial behavior is double serially mediated right by attitude and intention.

In addition, since student entrepreneurs are exposed to resources and support provided by their universities, such as Entrepreneurship Education (EE), and knowing that their entrepreneurial intent and desire are related to students' prior entrepreneurial exposure through entrepreneurial courses, we show that the effects of gender on cognitive processes and consequent entrepreneurial behaviors are different for those students who followed an EE course or not.

Keywords:

Entrepreneurial Intention-Behavior Link; Student Entrepreneurship; Theory of Planned Behavior; Gender; Entrepreneurship Education.

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4.1. INTRODUCTION

Women entrepreneurship is gaining greater attention among research scholars and policy-makers (Haus et al., 2013; Pergelova et al., 2023) since (also women) entrepreneurship represents a relevant phenomenon in terms of impact on individuals and societies: it is a creative act and a strategic means for innovation that contributes to economic growth, the creation of value for the individuals and the community, and poverty reduction (López-Delgado et al., 2019; Shinnar et al., 2018). There is an increasing awareness of the role of gender as a trigger of cognitive and behavioral dynamics in entrepreneurship domain (Bhatti et al., 2021; Feder & Niţu-Antonie, 2017; Haus et al., 2013; Maes et al., 2014; Shinnar et al., 2018). Yet, the number of women entrepreneurs is still relatively lower compared to men and a gender gap continues to persist (Pergelova et al., 2023; Piva & Rovelli, 2022; Villanueva-Flores et al., 2023), in some countries more than others (GEM, 2023), and in some fields and sectors more than in others (Gupta et al., 2009; Pergelova et al., 2023); preliminary research indicates that women might turn their entrepreneurial intentions less extensively than men into behaviors (Santos et al., 2016; Shinnar et al., 2018).

However, the causes of the lower propensity of women towards entrepreneurship are still not clear (Kautonen et al., 2015; Rauch & Hulsink, 2015; Shinnar et al., 2018) and more research is needed to explain the mechanisms that account for the different degrees of entrepreneurial behavior between women and men; in addition studies on the relationship between intentions and consequent behaviors (i.e., intentions-behavior causal relationship) in entrepreneurship research remain scarce (Fayolle & Liñán, 2014; Shinnar et al., 2018), which result to be the most important research challenge in the entrepreneurial intention area (Fayolle & Liñán, 2014; pp. 665).

Starting with students who have not already started a business and with the aim of analyzing their cognitive processes, we postulate the following research question: why do women (not) become entrepreneurs?

In this study, using Student Entrepreneurship – defined as the process of new venture creation by university students and graduates (Bergmann et al., 2016) – as the case of interest, we analyze if and how being a woman affects students' entrepreneurial behavior trying to understand the causes of this lower propensity of women towards entrepreneurship through a double serial mediation model. In particular, fully testing the

Theory of Planned Behavior (TPB; Ajzen, 1991), we propose that being a woman is negatively associated with the likelihood to engage in entrepreneurial behaviors and that this relationship is double serially mediated by intentions and antecedents of intentions (attitude, subjective norms, and perceived behavioral control). The TPB model has been typically applied to the field of entrepreneurship to explain intentions to become an entrepreneur and behaviors undertaken to start a business (i.e., the link entrepreneurial intention-behavior), yet in the TPB literature, very few studies include gender as a variable in their analyses (Nikou et al., 2019).

As individuals are essentially different and cognitive processes differ across genders (Haddad et al., 2016), we believe that antecedents of intentions differ between women and men and that gender impacts students' actions to pursue an entrepreneurial career (Nikou et al., 2019).

The empirical analysis is based on a longitudinal sample of university students who participated in both the 2016 and 2018 waves of the Global University Entrepreneurial Spirit Students' Survey (GUESSS). The final sample is composed of 1,197 students who, as of 2016, were not engaged in entrepreneurship.

Empirical results show that there is a significant and negative relationship between being a woman and the likelihood of engaging in entrepreneurial behavior; that entrepreneurial intentions mediate this relationship; and that there exists a double serially mediated effect through the attitude-intentions path (while subjective norms, self-efficacy, and locus of control - albeit predicting intention - do not mediate the woman-behavior link). Results highlight that women are less likely to engage in entrepreneurial activities not because they do not feel capable or legitimized, but specifically because they desire to do so to a lower degree.

In addition, since previous literature states that entrepreneurial intentions and behaviors are related to students' perceived university support (Ahsan et al., 2018; Autio et al., 2001) and particularly prior entrepreneurial exposure through Entrepreneurship Education (EE) courses (Cadenas et al., 2020; Debarliev et al., 2022; Hahn et al., 2020; Souitaris et al., 2007; von Graevenitz et al., 2010), we implement post-hoc analyses aimed to understand whether these effects of gender on cognitive processes and consequent entrepreneurial behaviors are different for those students who followed an EE course and not. Indeed, we believe that student entrepreneurs, since they are exposed to resources

and support provided by their universities, such as EE programs (Ahsan et al., 2018; Bergmann et al., 2016; Wright et al., 2017), represent a unique context currently overlooked above all when we consider gender differences and intention-behavior link (Shinnar et al., 2018).

This study offers several contributions to entrepreneurship literature. First, to the best of our knowledge, this is the first research supporting an explanation of *why* women are less entrepreneurial than men. Indeed, our research provides new theoretical and empirical insights by exploring gender differences through the lens of the TPB, confirming the importance of cognitive and behavioral dynamics in entrepreneurship.

Then, it answers the call for further research in the entrepreneurial process and intention-behavior link, which results in being the most important research challenge in the entrepreneurial intention area (Fayolle & Liñán, 2014; pp. 665).

This study also offers opportunities for future research. First, scholars could take more direct advantage of the student entrepreneurs setting and study more in detail the role of the university as a favorable context to foster and support (women) entrepreneurship, specifically considering the university climate and support encouraging students to engage in entrepreneurial activities – and, specifically, to underpin an entrepreneurial career – as a boundary condition. Also, since the model is not confirmed for those students who followed an EE course, further research to understand how and to what extent EE could enhance women's entrepreneurial behaviors could narrow the gender gap in the entrepreneurial field. Indeed, we encourage university practitioners to account for our results to design the most suitable teaching method to raise the entrepreneurial attitude of women and consequent entrepreneurial intentions and behaviors.

Lastly, future research might be interested in exploring the potential causes of woman-specific career development, by expanding our research and conceptualization to other labor market domains and career trajectories.

4.2. THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

4.2.1. Student Entrepreneurship and gender differences

Student Entrepreneurship – defined as the process of the creation of new ventures by university students and graduates (Bergmann et al., 2016; Colombo & Piva, 2020) – is

receiving great attention from scholars interested in investigating how universities increase the conditions in which intentions lead to entrepreneurial behavior (Meoli et al., 2020; Shinnar et al., 2018) and from policymakers for its impact on economic growth and job creation (Åstebro et al., 2012). Indeed, the prospering of our societies is therefore critically dependent on current and future entrepreneurial activities (Audretsch, 2014; Sieger et al., 2016), and especially students represent the entrepreneurs of tomorrow (Sieger et al., 2016).

Therefore, it is important to know how many students want to pursue an entrepreneurial career, why they want to do so, and how many are in the process of setting up or have already created a business (Sieger et al., 2016).

Student entrepreneurship as a case of interest warrants researcher attention for several reasons (Bergmamn et al., 2016): first, there is a significant level of interest among young individuals, particularly students, in pursuing entrepreneurial careers (Sieger et al., 2016) and since many students are ambitious and curious to explore different things during their academic path, the university settings are the ideal context for testing students' entrepreneurial competencies (Bergmamn et al., 2016); second, university research serves as a knowledge source, leading to the creation of new entrepreneurial opportunities and the formation of innovative firms (Audretsch and Lehmann, 2005) and since many universities have strategically transformed into Entrepreneurial Universities, actively engaging in fostering start-ups as a crucial goal (Etzkowitz et al., 2000), this paradigm shift in the university's role within regional innovation systems highlights the growing importance of student start-ups in knowledge transfer to the market (Åstebro et al., 2012); last, the evolution of the university role extends beyond technology transfer, emphasizing the broader goal of enhancing students' human capital (Audretsch, 2014), such as knowledge, skills, and abilities useful both to found new business and/or act entrepreneurially in different domains and different spheres of life (Lackéus, 2015; Larsen, 2022; Mawson et al., 2023).

Hence, several studies over time have focused on this phenomenon (Clarysse et al., 2022; Passavanti et al., 2023).

In recent years there has also been an increasing focus on the role of gender within entrepreneurial dynamics (e.g., Bhatti et al., 2021; Feder & Niţu-Antonie, 2017; Maes et al., 2014; Shinnar et al., 2018). Despite increasing awareness, a gender gap in

entrepreneurship persists (GEM, 2023; Pergelova et al., 2023; Piva & Rovelli, 2022; Villanueva-Flores et al., 2023), with fewer women engaging in entrepreneurial activities (Shinnar et al., 2018), and they might be less likely than men to turn their entrepreneurial intentions into actual business behaviors (Santos et al., 2016; Shinnar et al., 2018).

Nevertheless, gender studies on the relationship between entrepreneurial intentions and consequent behavior through empirical and longitudinal studies remain scarce (some exceptions, Kautonen et al., 2015; Rauch & Hulsink, 2015; Shinnar et al., 2018) and further research is needed to understand the mechanisms underlying the differential entrepreneurial behaviors between women and men.

In addition, literature on these topics highlights contradictory findings (Haus et al., 2013; Langowitz & Minniti, 2007; Wilson et al., 2007): while some studies have found that women tend to pursue entrepreneurial careers less often than men due to perceived gender barriers (Verheul et al., 2012), and that there exist gender differences in entrepreneurial intentions (Villanueva-Flores et al., 2023; Zhao et al., 2005), others have argued that gender similarities are much higher than differences and men and women do not differ in their entrepreneurial intentions (Gupta et al., 2009).

For these reasons, this study aims to try to understand the gender imbalance in the field of entrepreneurship contributing to the existing literature by exploring if and why women are less likely than men to implement entrepreneurial behaviors.

4.2.2. The Theory of Planned Behavior

The most impactful model used to explain the antecedent of behaviors and intentions is Ajzen's TPB (Ajzen, 1991). TPB is a widely used psychological theory that provides a framework for understanding human behavior, particularly in the context of decision-making and goal-directed actions (Ajzen, 1991).

Since intentions are the best predictor of actual behavior, including in the entrepreneurship field, understanding the antecedents of intentions also increases our understanding of the intended behavior. The TBP highlights that behavior is explained by an intention to try to perform such a behavior and it postulates three conceptually independent determinants of intentions: attitude toward the behavior, subjective norm, and perceived behavioral control. Attitudes are related to the degree of belief that a person has about the fact that a certain behavior will lead to a favorable outcome and refer to

whether an individual considers a behavior to be positive or not; subjective norms refer to the social pressure from others (like family or friends) that a person has before performing the behavior; perceived behavioral control refers to whether or not an individual believes that he/she is capable of excelling in the execution of a specific behavior and this includes both the factors of self-efficacy, and controllability of external factors defined as the locus of control.

According to the TPB, these three cognitive antecedents are reliable predictors for entrepreneurial intentions. The TPB model has been extensively applied to the field of entrepreneurship to explain individuals' intentions to become an entrepreneur and behaviors undertaken to start a business, providing insights into the factors that influence individuals' decisions to engage in entrepreneurial activities (Shinnar et al., 2018).

Entrepreneurial intention (EI) is an indication of the degree of effort an individual is willing to put up to perform entrepreneurial behavior (EB), become self-employed, and open his/her own business (Rauch & Hulsink, 2015). EB refers to actions and entry including gestation, actions, and behaviors to start a business. In this sense, engaging in entrepreneurship is a behavior that is affected by attitude toward entrepreneurship (ATT), that is the degree to which a person has a favorable or unfavorable evaluation of EB; by subjective norms (SN), that is the social pressure that a person perceives from parents, friends, and society to perform or not to perform EB; and the perceived ease or difficulty of performing EB (i.e., entrepreneurial locus of control, LoC) and the degree of volitional control on this behavior (i.e., entrepreneurial self-efficacy, ESE).

The theory suggests that positive ATT, supportive SN, and a sense of control over the entrepreneurial process (i.e., ESE and LoC) are more likely to lead to EIs and actual engagement in entrepreneurial activities (i.e., EB).

Researchers have recognized the relevance of cognitive processes and psychological factors in shaping EIs, which are crucial precursors to entrepreneurial actions (Krueger et al., 2000) which may differ between genders (Haddad et al., 2016). Indeed, previous research states that there exists a theoretical rationale to expect that gender differences occur in the factors that contribute to the development of entrepreneurial intentions and in the TPB constructs (Nikou et al., 2019).

Nevertheless, in the TPB literature, few studies include gender as a variable in their analyses (Nikou et al., 2019).

In this study, we test the TPB for examining gender differences in the entrepreneurship field acknowledging the role of gender as a critical factor for influencing cognitive and behavioral dynamics.

4.2.3. The effect of gender on entrepreneurial behaviors

The prevailing perception of entrepreneurs is closely tied to masculine attributes, leading to the formation of stereotypes that predominantly link entrepreneurial behavior predominantly with men (Ahl, 2006; Henry et al., 2016; Nikou et al., 2019; Gupta et al., 2009). Cultural beliefs and societal norms surrounding gender roles play a significant role in shaping the career choices of women pushing them toward directions more socially acceptable for their gender (Correll, 2011; Eagly & Wood, 2011; Hafeez et al., 2022).

Indeed, these cultural beliefs and societal norms exert an influence on women's decision-making by leading them toward career paths that are aligned with traditional gender expectations (Heilman, 1983) and, despite the significant progress, gender expectations in career choices and gender-based discriminations still persist (Heilman et al., 2024). This can include fields perceived as more nurturing, socially oriented, or feminine (Heilman, 1983; Heilman et al., 2024), such as education, healthcare, or social services. As a result, women may experience pressure from society to conform to these expectations and may be discouraged from pursuing careers that are traditionally male dominated, like entrepreneurship.

Although there has been an increase of women in entrepreneurship, empirical research indicates that women have a lower likelihood of founding entrepreneurial ventures (Bosma et al, 2012; GEM, 2023; Padilla-Angulo et al., 2022; Shinnar et al., 2018; Shirokova et al., 2016). Therefore, a gender gap still persists across different countries and women are less likely to become entrepreneurs compared to men (GEM, 2023; Laguía et al., 2019; Shinnar et al., 2018).

Accordingly, we advance the baseline hypothesis of our model:

Hypothesis 1: *Being a woman is negatively associated with entrepreneurial behavior (EB).*

4.2.4. The mediating role of the Theory of Planned Behavior constructs

Previous literature argues that attitude toward entrepreneurship is a reliable predictor of entrepreneurial intention (Adekiya and Ibrahim, 2016) and actual behavior (Ajzen, 1991; Rueda et al., 2015).

Additionally, according to Bandura (1997; 1989), individuals are more inclined to engage in actions they perceive as attainable.

As people tend to choose jobs socially acceptable for their gender and to match their behavior with the perceived characteristics and features that they believe are essential for successful behavior (Heilman, 1983), it is also plausible to expect gender differences in attitudes towards EB.

Accordingly, entrepreneurship is associated with characteristics such as aggression, success orientation, dominance, independence, challenge, and high risk-taking, which are more strongly linked to men than women (Ahl, 2006; Gupta et al., 2009; Haus et al., 2013; Laguía et al., 2019; Pergelova et al., 2023; Van Dijk & Van Engen, 2019; Villanueva-Flores et al., 2023). Indeed, women, compared to men, tend to avoid risk (Antoncic et al., 2018); men value challenge and financial success more than women, whereas women value other characteristics such as financial security, balancing work and family, and helping others (Carter et al., 2003; Maes et al., 2014). Given that men tend to exhibit entrepreneurial traits and behaviors to a greater extent, women may perceive a misfit between their own characteristics and the traits necessary for successful entrepreneurship (Haus et al., 2013; Nikou et al., 2019).

Consequently, not only women are less likely to become entrepreneurs, but they also appear less interested and attracted toward an entrepreneurial career (Antoncic et al., 2018; Maes et al., 2014; Verheul et al., 2012) since women have lower positive attitude toward entrepreneurship (Haus et al., 2013; Karimi et al., 2014; Nikou et al., 2019).

Accordingly, we propose the following hypothesis:

Hypothesis 2a: *Attitude toward entrepreneurship (ATT) mediates the relationship between being a woman and entrepreneurial behavior (EB).*

Individuals who have a network of supportive and relevant others around them are more likely create a new venture and specifically this network functions as a means to overcome external obstacles, offering the cognitive resources necessary to deal with

challenges (Meoli et al., 2020). Particularly, students' propensity to start a business is influenced also by individual and contextual determinants (Bergmann et al., 2016).

Therefore, individuals' perceptions of actions like entrepreneurial behaviors are shaped by the opinions and influences of those close to them (Ajzen, 1991; Verheul et al., 2012). Among these individuals, family members and friends hold a significant influence over an individual's decision to perform the behavior (Krueger et al., 2000).

According to previous literature, there exists gender differences in SN between men and women (Villanueva-Flores et al., 2023) and women require additional support to establish their legitimacy as potential entrepreneurs (Feder & Niţu-Antonie, 2017). Consequently, the SN that arise from their immediate environment hold higher significance for women compared to men (Feder & Niţu-Antonie, 2017).

Since entrepreneurship is considered a gendered process in which women and men face distinct social expectations and different degrees of support in their environment (Heilman et al., 2024; Langowitz & Minniti, 2007; Wilson et al., 2007; Zhao et al., 2005), and since masculinity dominates the image of entrepreneurship (Ahl, 2006; Henry et al., 2016), as a result, women are encouraged to view entrepreneurship as a masculine career (Barnir et al., 2011; Feder & Niţu-Antonie, 2017; Shinnar et al., 2012). Thus, women entrepreneurship is often viewed as less desirable and lacks societal support leading to women that are strongly influenced by subjective norms and predefined roles assigned to them (Haus et al., 2013). Thus, this may establish a social context where women receive less support in their entrepreneurial endeavors compared to men (Gupta et al., 2009; Haus et al., 2013; Maes et al., 2014; Nikou et al., 2019), and this is reflected in a lower level of EB.

Thus, we propose the following hypothesis:

Hypothesis 2b: *Subjective norms (SN) mediate the relationship between being a woman and entrepreneurial behavior (EB).*

Previous research exploring the impact of gender reveals that gender exerts a direct influence on entrepreneurial self-efficacy (Cardon and Kirk, 2015; Ladge et al., 2019; Nikou et al., 2019), and that men generally possess a higher degree of self-efficacy, while women tend to exhibit lower confidence in their abilities to start a business (Bergman et al., 2011; Haus et al., 2013; Maes et al., 2014; Shinnar et al., 2012; Wilson et al., 2007; Yang, 2013). Additionally, the qualities and attributes crucial for

entrepreneurship and business creation have been associated with masculinity (Heilman, 1983) and social expectations of both men and women have an impact on self-efficacy beliefs (Eagly, 1987; Haddad et al., 2016). Consequently, women experience lower self-esteem and are more likely to underestimate their skills and abilities than men considering themselves less appropriate for entrepreneurship. Moreover, as men and women choose careers that have traits that are similar to their own, women feel a mismatch between their personal attributes and the traits required to be a successful entrepreneur (Haus et al., 2013; Nikou et al., 2019). On the other hand, according to the social cognitive theory (Bandura, 2011), final behaviors are guided and influenced by individuals' self-efficacy in performing such a behavior. As a result, women perceive lower levels of ESE, which subsequently manifests in a lower degree of engagement in EB.

Then, we propose the following hypothesis:

Hypothesis 2c: *Entrepreneurial self-efficacy (ESE) mediates the relationship between being a woman and entrepreneurial behavior (EB).*

Again, previous literature underlines that being a man is positively linked to LoC (Liñán & Chen, 2009; Yang, 2013), which implies that men perceive engaging in entrepreneurial behavior easier than women. The same result was also found by Yang (2013), highlighting that women are negatively correlated with LoC with respect to men and consequently perceived more difficulty performing entrepreneurial behavior and pursuing an entrepreneurial career (Barnir et al., 2011; Langowitz & Minniti, 2007). In fact, women may perceive more barriers to entrepreneurship (Haus et al., 2013; Shinnar et al., 2012; Verheul et al., 2012) that affect their LoC and the consequent EB.

Consequently, we propose the following hypothesis:

Hypothesis 2d: *Locus of control (LoC) mediates the relationship between being a woman and entrepreneurial behavior (EB).*

4.2.5. The mediating role of entrepreneurial intentions

To date, scholars have recognized gender as a possible antecedent of EI (Marlow & McAdam, 2011; Wilson et al., 2007; Zhang et al., 2014). Considering the existing body of research, women tend to exhibit lower levels of EI compared to men (Gupta et al., 2009; Langowitz & Minniti, 2007; Santos et al., 2016; Shinnar et al., 2012; Wilson et al., 2007; Zhao et al., 2005), and this lower inclination of women to pursue an entrepreneurial

career is a significant contributing factor to their less engagement in self-employment (Verheul et al., 2012).

Accordingly, these arguments highlight the persistence of a gender effect that suggests the presence of gender-related barriers to entrepreneurship (Verheul et al., 2012).

Based on this assumption, we advance the third hypothesis:

Hypothesis 3: *Entrepreneurial intention (EI) mediates the relationship between being a woman and entrepreneurial behavior (EB).*

4.2.6. A double-serial mediation effect

Building on Ajzen's (1991) TPB, we know that determinants such as ATT, SN, ESE, and LoC influence and are cognitive antecedents and reliable predictors of people's EI. However, "EI and its antecedents, are only important if they lead to meaningful outcomes, such as start-up behaviors" (Shinnar et al., 2018, pp. 63). Accordingly, EI motivates people to establish their own businesses (Ajzen, 1991; Kautonen et al., 2015; Rauch & Hulsink, 2015; Van Gelderen et al., 2015).

Numerous TPB studies emphasize the cognitive antecedents of EI (Entrialgo & Iglesias, 2016, 2017; Kautonen et al., 2015; Rauch & Hulsink, 2015; Zhang et al., 2014), some others investigate the role of TPB constructs in mediating the relationship between gender and EI (Haus et al., 2013; Maes et al., 2014); nevertheless, no research investigates the double mediation of TPB constructs and EI in the link between gender and EB.

Combing these arguments, we formulate the following hypotheses considering all four antecedents of EIs:

Hypothesis 4a: *The relationship between being a woman and entrepreneurial behavior (EB) is sequentially and double mediated by attitude toward the behavior (ATT) and entrepreneurial intention (EI).*

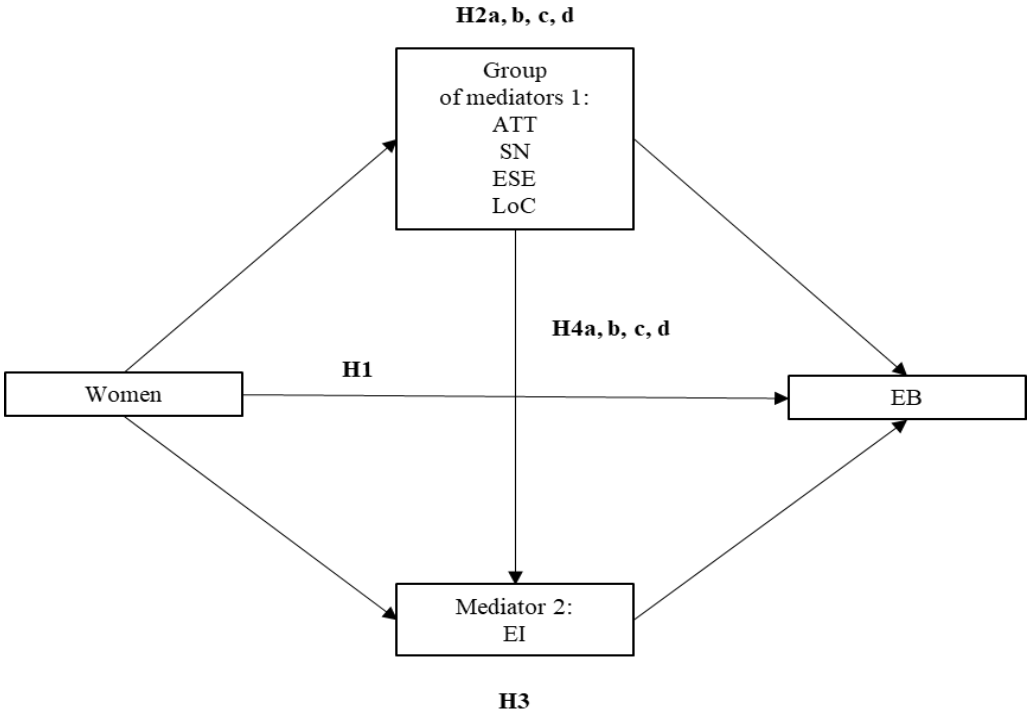
Hypothesis 4b: *The relationship between being a woman and entrepreneurial behavior (EB) is sequentially and double mediated by subjective norms (SN) and entrepreneurial intention (EI).*

Hypothesis 4c: *The relationship between being a woman and entrepreneurial behavior (EB) is sequentially and double mediated by entrepreneurial self-efficacy (ESE) and entrepreneurial intention (EI).*

Hypothesis 4d: *The relationship between being a woman and entrepreneurial behavior (EB) is sequentially and double mediated by locus of control (LoC) and entrepreneurial intention (EI).*

To summarize the hypothesis section, Figure 9 visualizes the research model of this study.

Figure 9. Conceptual framework of the double serial mediation model.



4.3. METHODOLOGY

4.3.1. Research design

The empirical analysis of this work is based on a sample of the Global University Entrepreneurial Spirit Students' Survey (GUESSS), one of the largest research projects that specifically concerns Student Entrepreneurship. The GUESSS project, coordinated by the University of St. Gallen and the University of Bern in Switzerland, consists of global data collection through online questionnaires, and in particular, this work refers to the longitudinal data collections of the 2016 and 2018 waves.

The 2016 collection, the seventh edition of GUESSS that took place between April and July 2016, covered 50 countries, more than 1,000 universities, and 122,509 completed answers. The data collection in autumn 2018, on the other hand, was the eighth

data collection, involving 54 countries, and more than 3,000 universities, and more than 208,000 complete responses were collected.

We choose to use the GUESSS database as it is a well-known academic initiative that involves a large number of university students and has resulted in several peer-reviewed articles in prestigious journals. It includes specific details regarding the respondents' studies, particularly the variables of our interest. GUESSS data has been used for several publications and the research topics concern (i) entrepreneurial intentions (ii) nascent entrepreneurship (ii) growth and performance of new ventures (iv) family firm succession (v) corresponding influencing factors on different levels, such as individual-level (motives, preferences, social identity), family level (family structure, family relationships), university-level (EE, entrepreneurial climate, and learning), contextual level (culture and institutions).

4.3.2. Sample

As the study is based on the merged GUESSS dataset 2016-2018, the students taken into consideration in this study are only those who participated in both waves of the survey (1,707 respondents).

To identify the students, GUESSS uses their e-mail as a unique identifier, but the data were then analyzed anonymously. Despite both the 2016 and 2018 GUESSS data collections collecting more than 100,000 responses, the aggregate sample was smaller because not all countries and all universities took part in both GUESSS collections and because some students may have left the university between the two surveys or just have not answered at both.

To perform the analysis, as we were interested in only students who in 2016 were not business owners or who were not involved in the process of business creation, we deleted observations by participants who in 2016 were already actively engaged in the process of setting up their own business (as nascent entrepreneurs) and those who were self-employed or already engaged in other entrepreneurial activities (as active entrepreneurs). Starting from the initial sample, we deleted observations for those students already involved in entrepreneurial activities before 2016 (i.e., 380 observations were deleted).

Then, we checked whether those students who declared themselves as nascent entrepreneurs in 2018 had actually carried out some entrepreneurial activities in order to start their own business (e.g., discussed product or business idea with potential customers; collected information about markets or competitors; written a business plan; started product/service development; started marketing or promotion efforts; purchased material, equipment or machinery for the business; attempted to obtain external funding; applied for a patent, copyright, or trademark; registered the business; sold product or service): 27 students declared themselves as nascent entrepreneurs in 2018 but they also declared to do not have carried out any activities mentioned above, thus we deleted those observations.

Eventually, we examined the data for missing values, and observations of participants with missing values in the areas of interest are removed.

The final sample is composed of 1,197 students not yet engaged in entrepreneurial activities during the 2016 GUESSS collection and who also took part in the 2018 GUESSS collection.

Since EI takes a certain amount of time to transform into actual EB (Kautonen et al., 2015), the data collections used in this study, that of 2016 and 2018, between which 2.5 years elapse, are in line with previous studies on the intention-behavior link in entrepreneurship that estimate a time interval between 1 and 3 years (Kautonen et al., 2015; Shinnar et al., 2018). Of the 1,197 students, only 19% declared themselves as nascent or active entrepreneurs in 2018.

4.3.3. Measures

Dependent variable. In line with other studies investigating the intention-behavior relationship in entrepreneurship (Kautonen et al., 2015; Shirokova et al., 2016), the dependent variable of this study is EB measured on the 2018 GUESSS collection considering respondents that during the two years have founded (active entrepreneurs) or were in the process of founding (nascent entrepreneurs) their own business. It is a dummy variable that measures if a student in 2018 declares himself/herself as a nascent or active entrepreneur. The questions that measure these constructs are (i) *"Are you currently trying to start your own business/to become self-employed?"* and (ii) *"Are you already running your own business/are you already self-employed?"*. Then, we build the dummy

variable EB that takes the value of 1 if the respondent answers with *"Yes"* (coded as 1) in the first or second question and so are considered nascent or active entrepreneurs in 2018.

Independent variable. As the independent variable, we assume the respondents' gender considering the traditional binary variable following the wake of other similar works (Shinnar et al., 2012, 2014, 2018). According to previous studies, the variable *Women* is coded as a dummy variable where the values of 0 are used for males and the value 1 is used for females.

Group of mediators 1. According to Ajzen (1991), we classified the antecedents of EI as the group of mediators 1 considering them one by one and measuring them on the 2016 GUESSS wave. We considered as the first mediator 1 the *Attitude toward entrepreneurship* (ATT), measured using the 5-item 7-point Likert scale by Liñán & Chen (2009). The items of the scale are as follows: (1) "Being an entrepreneur implies more advantages than disadvantages to me"; (2) "A career as entrepreneur is attractive for me"; (3) "If I had the opportunity and resources, I would become an entrepreneur"; (4) "Being an entrepreneur would entail great satisfaction for me"; (5) "Among various options, I would rather become an entrepreneur". The reliability of the scale was tested by computing Cronbach's alpha, which resulted in 0.942, which is above the recommended value of 0.7 (Nunnally, 1978). The scores of the items were thus averaged to compute the ATT variable.

We considered as second mediator 1 the *Subjective Norm* (SN) measured using the 3-item 7-point Likert scale by Liñán & Chen (2009) answering the question "If you would pursue a career as an entrepreneur, how would people in your environment react?". The items are the following: (1) "your close family"; (2) "your friends"; (3) "your fellow students". The reliability of the scale was tested by computing Cronbach's alpha, which resulted in 0.823. The scores of the items were thus averaged to compute the SN variable.

We considered as third mediator 1 the *Entrepreneurial Self-Efficacy* (ESE) measured using a 7-item 7-point Likert scale inspired by the scales developed by several authors (Chen et al., 1998; Kickul et al., 2009; Zhao et al., 2005). The items are: (1) "identifying new business opportunities"; (2) "creating new products and services"; (3) "managing innovation within a business"; (4) "being a leader and communicator"; (5) "building up a professional network"; (6) "commercializing a new idea or development";

(7) “successfully managing a business”. The reliability of the scale was tested by computing Cronbach’s alpha, which resulted in 0.919. The scores of the items were thus averaged to compute the ESE variable.

We considered as fourth mediator 1 the *Locus of Control* (LoC) measured using the 3-item 7-point Likert scale by Liñán & Chen (2009). The items are the following: (1) “I am usually able to protect my personal interests”; (2) “When I make plans, I am almost certain to make them work”; (3) “I can pretty much determine what will happen in my life”. The reliability of the scale was tested by computing Cronbach’s alpha, which resulted in 0.772. The scores of the items were thus averaged to compute the LoC variable.

Mediator 2. We considered as the second mediator of the double serial mediation model *Entrepreneurial Intention* (EI) measured on the 2016 GUESSS wave. It is measured using the 6-item 7-point Likert scale by Liñán & Chen (2009). The items of the scale are as follows: (1) “I am ready to do anything to be an entrepreneur”; (2) “My professional goal is to become an entrepreneur”; (3) “I will make every effort to start and run my own business”; (4) “I am determined to create a business in the future; (5) I have very seriously thought of starting a business”; (6) “I have a strong intention to start a business someday”. The reliability of the scale was tested by computing Cronbach’s alpha, which resulted in 0.961, and the scores of the items were thus averaged to compute the EI variable.

Control variables. Finally, we controlled for a set of demographic and student-related variables measured in the 2016 GUESSS wave. Since age is one of the crucial determinants of an individual’s decision to become an entrepreneur and it has an effect on entrepreneurial decisions regardless of environmental circumstances and it could influence individuals’ predisposition to learn and act (Hahn et al., 2020), we controlled for *Age*, measured in years.

We also controlled students’ level of study, as education can contribute to developing entrepreneurial skills and learning (Cascavilla et al., 2022; Hahn et al., 2017, 2020) which might affect the cognitive processes and consequents EI and EB. We built a dummy variable named *Undergraduate* (equal to 1 if, in 2016, a student is enrolled in a bachelor course, 0 otherwise).

Then, we also controlled students’ fields of study because interests and attitudes towards entrepreneurship could vary across students of different disciplines (Shinnar et

al., 2009); in fact, students of economics or business/management disciplines are more inclined towards entrepreneurship (Cascavilla et al., 2022; Hahn et al., 2017, 2020). To do so, we created a set of dummy variables considering the field of study (equal to 1 if the respondent studies in the selected disciplinary area, 0 otherwise): (1) *Social Sciences*, (2) *Natural Sciences*, (3) *Business, Economics, and Management*.

Finally, we controlled for parents' self-employment as there is evidence that having entrepreneurial parents could affect EB and exposure to entrepreneurship in the family context is a predictor of EI and actions (Lindquist et al., 2015). In this regard, we created a dummy variable named *Self-employed Parents* that indicates if an individual has, at least, one self-employed parent (equal to 1) or not (equal to 0).

4.3.4. Analysis

In this research, we used the approach suggested by Hayes (2018) to test the double serial mediation model through the bootstrapping method to estimate indirect effects by continually resampling the acquired data thousands of times (5,000 times in this study). This method generates an empirical representation of the sampling distribution, which is then used to estimate indirect effects with 95% confidence intervals. As a result, we used OLS regression approaches based on Hayes' (2018) process macros to evaluate our hypotheses (Macro n. 6).

4.4. RESULTS

Descriptive statistics are presented in Table 23 and descriptive statistics divided by gender are presented in Table 24.

Table 23. Descriptive statistics.

Variables	*Mean*	*St. Dev.*
Women	0.6157	0.4866
EI	4.0462	1.8783
EB	0.1855	0.3889
ATT	4.6568	1.6654
SN	5.7324	1.1038
ESE	4.5570	1.2849
LoC	5.1930	1.1187
Age	22.5664	4.0044
Undergraduate	0.9198	0.2717
Social Sciences	0.2598	0.4387
Natural Sciences	0.3208	0.4670
Business, Economics, and Management	0.3392	0.4736
Self-employed Parents	0.2932	0.4554
EE	0.3417	0.4745

N = 1,197 observations.

Table 24. Descriptive statistics by gender.

Variables	**Men (N = 460)**		**Women (N = 737)**	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*
EI	4.2783	1.7822	3.9014	1.9229
EB	0.2130	0.4099	0.1682	0.3743
ATT	4.8639	1.6144	4.5275	1.6847
SN	5.7217	1.1221	5.7390	1.0929
ESE	4.6425	1.2502	4.5036	1.3041
LoC	5.1616	1.0697	5.2126	1.1486
Age	23.0696	4.2743	22.2524	3.7956
Undergraduate	0.9239	0.2654	0.9172	0.2757
Social Sciences	0.1739	0.3794	0.3134	0.4642
Natural Sciences	0.4630	0.4992	0.2320	0.4224
Business, Economics, and Management	0.2978	0.4578	0.3650	0.4818
Self-employed Parents	0.3087	0.4625	0.2836	0.4510
EE	0.3478	0.4768	0.3379	0.4733

The sample is composed of 460 men and 737 women. Men show higher levels of EI (4.2783) compared to women (3.9014); considering EB, about 21.30% of men are active or nascent entrepreneurs in 2018, while only 16.82% of women are entrepreneurs in 2018: hence, women present lower levels of both EI and EB. In terms of field of study, about 36% of women and 30% of men are students of Business, Economics, and

Management; about 23% of women and 46% of men are students in Natural Sciences; and about 31% of women and 17% of men are students of Social Sciences.

The majority of both women and men (respectively, 92.39% and 91.72%) are Undergraduates.

About 31% of men and 28% of women have at least one parent as self-employed and only 35% of men and 34% of women have followed at least one EE course during their academic path before 2016.

In Table 25, the correlation matrix is presented; it shows that EB is significantly and positively correlated to EI, which in turn is significantly and positively correlated to ATT, SN, ESE, and LoC.

The gender of students (i.e., Women) is significantly and negatively correlated with EI, EB, ATT, and ESE, but not with SN and LoC.

Table 25. Pairwise correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Women	1.0000													
(2) EI	-0.0976*	1.0000												
(3) EB	-0.0561	0.2521*	1.0000											
(4) ATT	-0.0983*	0.8539*	0.2146*	1.0000										
(5) SN	0.0076	0.4015*	0.1183*	0.4297*	1.0000									
(6) ESE	-0.0526	0.5784*	0.1808*	0.5840*	0.3833*	1.0000								
(7) LOC	0.0222	0.3164*	0.1047*	0.3395*	0.2854*	0.5317*	1.0000							
(8) Age	-0.0993*	-0.0497	0.0350	-0.0335	-0.0635*	-0.0245	-0.0184	1.0000						
(9) Undergraduate	-0.0120	0.0993*	0.0618*	0.0651*	0.0585*	0.0617*	-0.0242	-0.1765*	1.0000					
(10) Social Sciences	0.1548*	-0.1615*	-0.0229	-0.1527*	-0.0951*	-0.1561*	-0.0739*	0.1070*	-0.0495	1.0000				
(11) Natural Sciences	-0.2407*	0.0271	-0.0102	0.0447	0.0099	0.0256	-0.0156	-0.0709*	0.0448	-0.4072*	1.0000			
(12) Business, Economics, and Management	0.0690*	0.1188*	0.0077	0.1117*	0.0730*	0.1233*	0.0815*	-0.0463	0.0231	-0.4245*	-0.4924*	1.0000		
(13) Self-employed Parents	-0.0268	0.1242*	0.0798*	0.1054*	0.1130*	0.1289*	0.0393	-0.1040*	-0.0395	-0.0803*	0.0330	0.0269	1.0000	
(14) EE	-0.0102	0.1888*	0.0460	0.1697*	0.1093*	0.1429*	0.0563	-0.0346	-0.0467	-0.2421*	0.0068	0.2317*	0.0312	1.0000

*N= 1,197 observations. * $p < 0.05$*

The results of the regression analysis are presented from Table 26 to Table 30 and the results for the indirect effect from Table 31 to Table 34.

To assess multicollinearity, we computed the variance inflation factors to quantify how inflated the variance is and all the values remained below 10 (Kennedy, 2008). Consequently, we can assume that multicollinearity is not an issue in the analyses.

Table 26. Main regression analysis.

	Model 1
Variables	DV: EB
Age	0.0316*
	(0.0185)
Undergraduate	0.8522**
	(0.3493)
Social Sciences	-0.3872
	(0.2865)
Natural Sciences	-0.4347
	(0.2804)
Business, Economics, and Management	-0.3067
	(0.2742)
Self-employed Parents	0.4668***
	(0.1596)
Women	-0.2767*
	(0.1580)
Constant	-2.6393***
	(0.6531)
Observations	1,197
R-square	-
Pseudo R-square	0.0192

*Robust standard errors in brackets, *** p < 0.01, ** p < 0.05, * p < 0.1*

Table 27. Regression analysis with ATT as the first mediator.

Variables	**Model 2a** DV: ATT	**Model 2b** DV: EI	**Model 2c** DV: EB
Age	-0.0026	-0.0052	0.0359*
	(0.0122)	(0.0073)	(0.0189)
Undergraduate	0.3622**	0.3038***	0.6687*
	(0.1770)	(0.1055)	(0.3616)
Social Sciences	-0.2414	-0.2674**	-0.2369
	(0.1909)	(0.1137)	(0.2990)
Natural Sciences	0.1658	-0.2413**	-0.4335
	(0.1883)	(0.1121)	(0.2916)
Business, Economics, and Management	0.3833**	-0.1290	-0.4156
	(0.1855)	(0.1106)	(0.2855)
Self-employed Parents	0.3487***	0.1377**	0.3251**
	(0.1046)	(0.0626)	(0.1656)
Women	-0.2810***	-0.0659	-0.1759
	(0.1010)	(0.0603)	(0.1630)
ATT		0.9499***	0.0351
		(0.0173)	(0.0971)
EI			0.3471***
			(0.0842)
Constant	4.3315***	-0.3487	-4.3017***
	(0.4013)	(0.2504)	(0.7252)
Observations	1,197	1,197	1,197
R-square	0.0461	0.7344	-
Pseudo R-square	-	-	0.0816

*Robust standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Table 28. Regression analysis with SN as the first mediator.

Variables	**Model 3a** DV: SN	**Model 3b** DV: EI	**Model 3c** DV: EB
Age	-0.0091	-0.0017	0.0363*
	(0.0082)	(0.0127)	(0.0189)
Undergraduate	0.2156*	0.5092***	0.6610*
	(0.1185)	(0.1835)	(0.3617)
Social Sciences	-0.1875	-0.3762*	-0.2311
	(0.1278)	(0.1978)	(0.2989)
Natural Sciences	-0.0250	-0.0677	-0.4238
	(0.1261)	(0.1950)	(0.2908)
Business, Economics, and Management	0.0688	0.1908	-0.4082
	(0.1242)	(0.1921)	(0.2853)
Self-employed Parents	0.2559***	0.3045***	0.3162*
	(0.0701)	(0.1090)	(0.1661)
Women	0.0335	-0.3543***	-0.1821
	(0.0676)	(0.1046)	(0.1633)
SN		0.6427***	0.0520
		(0.0448)	(0.0819)
EI			0.3606***
			(0.0502)
Constant	5.6779***	0.1166	-4.4926***
	(0.2687)	(0.4874)	(0.8088)
Observations	1,197	1,197	1,197
R-square	0.0264	0.1967	-
Pseudo R-square	-	-	0.0819

*Robust standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Table 29. Regression analysis with ESE as the first mediator.

Variables	**Model 4a** DV: ESE	**Model 4b** DV: EI	**Model 4c** DV: EB
Age	0.0034	-0.0104	0.0354*
	(0.0094)	(0.0114)	(0.0189)
Undergraduate	0.2857**	0.4163**	0.6637*
	(0.1365)	(0.1651)	(0.3626)
Social Sciences	-0.2727*	-0.2757	-0.2224
	(0.1472)	(0.1780)	(0.2997)
Natural Sciences	0.0498	-0.1241	-0.4339
	(0.1452)	(0.1753)	(0.2913)
Business, Economics, and Management	0.2467*	0.0352	-0.4221
	(0.1430)	(0.1729)	(0.2858)
Self-employed Parents	0.3412***	0.1925*	0.3110*
	(0.0807)	(0.0982)	(0.1659)
Women	-0.0927	-0.2577***	-0.1846
	(0.0779)	(0.0941)	(0.1633)
ESE		0.8102***	0.1254
		(0.0350)	(0.0791)
EI			0.3254***
			(0.0549)
Constant	4.1448***	0.4074	-4.6029***
	(0.3095)	(0.4008)	(0.7488)
Observations	1,197	1,197	1,197
R-square	0.0471	0.3506	-
Pseudo R-square	-	-	0.0837

*Robust standard errors in brackets, *** p < 0.01, ** p < 0.05, * p < 0.1*

Table 30. Regression analysis with LoC as the first mediator.

Variables	**Model 5a** DV: LoC	**Model 5b** DV: EI	**Model 5c** DV: EB
Age	-0.0027	-0.0062	0.0362*
	(0.0084)	(0.0130)	(0.0189)
Undergraduate	-0.1152	0.7069***	0.6751*
	(0.1210)	(0.1885)	(0.3615)
Social Sciences	-0.1477	-0.4209**	-0.2320
	(0.1306)	(0.2034)	(0.2988)
Natural Sciences	-0.0216	-0.0727	-0.4281
	(0.1288)	(0.2006)	(0.2907)
Business, Economics, and Management	0.1183	0.1744	-0.4197
	(0.1268)	(0.1976)	(0.2854)
Self-employed Parents	0.0789	0.4285***	0.3273**
	(0.0716)	(0.1115)	(0.1657)
Women	0.0576	-0.3624***	-0.1877
	(0.0691)	(0.1076)	(0.1635)
LoC		0.5130***	0.0707
		(0.0452)	(0.0785)
EI			0.3566***
			(0.0496)
Constant	5.3065***	1.0434**	-4.5498***
	(0.2745)	(0.4900)	(0.7870)
Observations	1,197	1,197	1,197
R-square	0.0112	0.1502	-
Pseudo R-square	-	-	0.0822

*Robust standard errors in brackets, *** p < 0.01, ** p < 0.05, * p < 0.1*

Table 31. Mediation analysis, indirect effects (model with ATT as the first mediator).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	-0.0118	0.0328	-0.0761	0.0526
Ind2: Women →EI→EB	-0.0186	0.0207	-0.0592	0.0221
Ind3: Women →ATT→EI→EB	-0.1123	0.0427	-0.1960	-0.0285

Observations =1,197

Table 32. Mediation analysis, indirect effects (model with SN as the first mediator).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →SN →EB	0.0009	0.0037	-0.0063	0.0081
Ind2: Women →EI →EB	-0.1402	0.0415	-0.2215	-0.0588
Ind3: Women →SN →EI →EB	0.0043	0.0162	-0.0275	0.0360

Observations =1,197

Table 33. Mediation analysis, indirect effects (model with ESE as the first mediator).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ESE →EB	-0.0174	0.0146	-0.0460	0.0111
Ind2: Women →EI →EB	-0.0846	0.0328	-0.1490	-0.0203
Ind3: Women →ESE →EI →EB	-0.0380	0.0219	-0.0808	0.0048

Observations =1,197

Table 34. Mediation analysis, indirect effects (model with LoC as the first mediator).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women→LoC →EB	0.0036	0.0062	-0.0085	0.0157
Ind2: Women →EI →EB	-0.1441	0.0425	-0.2275	-0.0608
Ind3: Women →LoC →EI →EB	0.0097	0.0128	-0.0153	0.0348

Observations =1,197

Table 26 (Model 1) shows the result of the main effect of gender on EB (β = -0.2767, $p < 0.1$). Therefore, H1 is supported: women have lower levels of EB with respect to their male counterparts.

Table 27 shows the results of all the regression analyses and partial effects when considering ATT as the first mediator (Model 2a, 2b, 2c). As we can see from Model 2a, there is a significant negative effect of being a woman on ATT (β = -0.2810, $p < 0.01$), underlying that women present lower ATT than men. ATT has a significant positive effect on EI (Model 2b: β = 0.9499, $p < 0.01$), but being a woman has no significant impact on EI (β = -0.0659, $p > 0.1$) when the variable ATT is added in the model. Last, Model 2c shows that EI has a significant and positive effect on EB when ATT is taken into consideration as mediator 1 (β = 0.3471, $p < 0.01$); on the other hand, in Model 2c, there are no significant effects of being a woman and ATT on EB.

Considering the analysis that identifies the SN as the first mediator (Table 28), we can highlight the following results: as we can see from Model 3a, being a woman does not have a significant effect on SN (β = 0.0335, $p > 0.1$). From Model 3b, we show that

SN has a significant positive effect on EI ($\beta = 0.6427$, $p < 0.01$) and that being a woman has a significant and negative impact on EI ($\beta = -0.3543$, $p < 0.01$). Model 3c shows that EI has a significantly positive effect on EB when SN is taken into consideration as mediator 1 ($\beta = 0.3606$, $p < 0.01$), but again we found no significant effects of being a woman and SN on EB.

Moving toward the analysis with ESE as the first mediator (Table 29), the results are similar to the previous case (i.e., the model with SN). Model 4a shows a non-significant effect of being a woman on ESE ($\beta = -0.0927$, $p > 0.1$); Model 4b that there exists a significant positive effect of ESE on EI ($\beta = 0.8102$, $p < 0.01$) and that being a woman has a significant and negative impact on EI ($\beta = -0.\ 2577$, $p < 0.01$); and last, Model 4c that EI has a significantly positive effect on EB when ESE is taken into consideration as mediator 1 ($\beta = 0.3254$, $p < 0.01$), but there are no significant effects of being a woman and SN on EB.

Last, considering the analysis with LoC as the first mediator (Table 30), we find similar results to the previous models (i.e., SN and ESE models): non-significant effect of being a woman on LoC (Model 5a: $\beta = 0.0576$, $p > 0.1$); significant positive effect of LoC on EI (Model 5b: $\beta = 0.5130$, $p < 0.01$) and significant negative effect of being a woman on EI (Model 5b: $\beta = -0.3624$, $p < 0.01$); significant positive effect of EI on EB when LoC is taken into consideration as mediator 1 (Model 5c: $\beta = 0.3566$, $p < 0.01$), but no significant effects of being a woman and LoC on EB.

Then, through the bootstrapping method to estimate indirect effects we tested the mediation analyses.

Table 31 presents the coefficients and bootstrap confidence intervals of all indirect effects to evaluate the mediation hypotheses. As proposed in Hypothesis 2a, we first tested the effect of being a woman on EB through ATT (Women → ATT → EB; $\beta = -0.0118$, SE = 0.0328, IC [-0.0761; 0.0526]). We do not find significant results; consequently, H2a is not supported.

H3 posits the influence of being a woman on EB through EI (Women → EI → EB; $\beta = -0.01868$, SE = 0.0207, IC [-0.0592; 0.0221]). This indirect effect, when ATT is considered as mediator 1, is not significant. Consequently, H3 is not supported when ATT is considered.

The last indirect effect assesses the double serial mediation proposed in H4a in which being a woman influences EB sequentially through ATT and EI (Women → ATT → EI → EB). As this bootstrap confidence interval is entirely below zero (β = -0.1123, SE = 0.0427, IC [-0.1960; -0.0285]), H4a is supported: the relationship between being a woman and EB is sequentially and double mediated by ATT and EI.

Table 32 shows the indirect effects for the mediation analysis considering SN as the first mediator. Hypothesis 2b states that SN mediates the relationship between being a woman and EB (Women → SN → EB; β = 0.0009, SE = 0.0037, IC [-0.0063; 0.0081]); therefore, H2b is not supported since there is no significant effect.

We tested H3 (Women → EI → EB) when the SN variable is considered in the model leading to a negative and significant result supporting H3 when SN is considered (β = -0.1402, SE = 0.0415, IC [-0.2215; -0.0588]).

Then, we tested the double serial mediation through SN and EI finding no significant results (Women → SN → EI → EB; β = 0.0043, SE = 0.0162, IC [-0.0275; 0.0360]); therefore, H4b is not supported.

Table 33 shows the indirect effects for the mediation analysis considering ESE as the first mediator underlying the non-significant mediation effect of ESE in the relationship between being a woman and EB (Women → ESE → EB; β = -0.0174, SE = 0.0146, IC [-0.0460; 0.0111]). Thus, we refuse H2c.

Again, we tested H3 (Women → EI → EB) when ESE is considered in the model leading to a negative and significant result supporting H3 when ESE is considered (β = -0.0846, SE = 0.0328, IC [-0.1490; -0.0203]).

Then, we tested the double serial mediation through ESE and EI finding again no significant results (Women → ESE → EI → EB; β = -0.0380, SE = 0.0219, IC [-0.0808; 0.0048]); therefore, H4c is not supported.

Last, Table 34 shows the indirect effects of the mediation analysis considering LoC as the first mediator underlying, again, the non-significant mediation effect of LoC in the relationship between being a woman and EB (Women → LoC → EB; β = 0.0036, SE = 0.0062, IC [-0.0085; 0.0157]); hence, also H2d is not supported.

We tested H3 (Women → EI → EB) also when LoC is considered in the model confirming the mediation effect between being a woman and EB through the mediator EI, we found a negative effect (β = -0.1441, SE = 0.0425, IC [-0.2275; -0.0608]).

The last indirect effect assesses the double serial mediation proposed in H4d in which being a woman influences EB sequentially through LoC and EI (Women → LoC → EI → EB). Once again, we found no statistically significant results for this analysis (β = 0.0097, SE = 0.0128, IC [-0.0153; 0.0348]), thus H4d is not supported.

In conclusion, there is a double serially mediated effect between being a woman and EB only when ATT is considered as mediator 1, in the other cases there is only a mediating effect of EI between being a woman and EB.

4.4.1. Post-hoc analyses

EE, that is courses, programs, and initiatives designed to equip students with the knowledge, skills, and attitudes necessary to identify and act upon value-creating opportunities (Zhang et al., 2014), has the potential to enhance the number of entrepreneurs and, consequently, stimulate the economic growth (Rauch & Hulsink, 2015).

Several studies show the impacts of EE on cognitive antecedents related to entrepreneurship (Bae et al., 2014; Martin et al., 2013; Nabi et al., 2017), such as ATT (e.g., Debarliev et al., 2020; Entrialgo & Iglesias, 2016, 2017; Fayolle & Gailly, 2015; González-López et al., 2019; Heuer & Kolvereid, 2014; Ng et al., 2019; Otache et al., 2019a), SN (e.g., Ahmed et al., 2017; Fayolle & Gailly, 2015; Feder & Niţu-Antonie, 2017; Galvão et al., 2018; Otache et al., 2021; Passaro et al., 2018; von Graevenitz et al., 2010), ESE (e.g., Bergman et al., 2011; Cadenas et al., 2020; Hahn et al., 2020; Karlsson & Moberg, 2013; Shinnar et al., 2014; von Graevenitz et al., 2010), LoC (e.g., Alaref et al., 2020; Blimpo & Pugatch, 2021; Premand et al., 2016), but also EI (Ayed, 2020; Debarliev et al., 2022; Haddoud et al., 2022; Longva et al., 2020; Nabi et al., 2018; Oosterbeek et al., 2010; Passaro et al., 2018; Rauch & Hulsink, 2015; Souitaris et al., 2007; von Graevenitz et al., 2010; Walter & Dohse, 2012; Zellweger & Zenger, 2021; Zhang et al., 2014) and final EB (Bischoff et al., 2020; Blimpo & Pugatch, 2021; Gielnik et al., 2015, 2017; Karlsson & Moberg, 2013; Rauch & Hulsink, 2015; Rippa et al., 2020; Shinnar et al., 2018; Souitaris et al., 2007).

Hence, studies have examined the effects of EE on these outcomes, providing insights into the potential of EE to shape individuals' cognitive processes and behaviors (Bae et al., 2014; Martin et al., 2013; Nabi et al., 2017).

Despite the extensive body of knowledge about the topic, conflicting results about the impact of EE on different outcomes still remain (Nabi et al., 2017). As a result, previous literature suggests examining whether the impact of EE interventions on outcomes is gender-specific in order to explore contextual reasons for contradictory findings in EE impact studies (Nabi et al., 2017).

To do so, we analyzed the moderating effect of Entrepreneurship Education (EE) in the cognitive processes related to the intention-behavior link since previous studies show that EE improves students' entrepreneurial skills and beliefs and encourages people to start their own businesses (Bae et al., 2014; Martin et al., 2013; Nabi et al., 2017). We divided the sample into subsamples by using a dummy variable named EE that indicates if an individual before 2016 has attended, at least, one entrepreneurship course (equal to 1) or not (equal to 0). Then we run the regression analysis separately following the awake of previous research in EE impact studies (i.e., Padilla-Angulo et al., 2022) and splitting the sample into two categories: (i) students that before 2016 followed at least one EE course, (ii) students that before 2016 followed no EE courses[14].

Considering the first category of students (those that followed at least one EE course), results change drastically. First, we found a non-significant effect of being a woman on EB ($\beta = -0.1605$, $p > 0.1$). Then, considering the mediation analyses, again we found no significant mediation, thus refusing all the hypotheses of the principal model: ATT/SN/ESE/LoC does not mediate the relationship between gender and EB, EI does not mediate the relationship between gender and EB, there are no double serially mediated effects that are statistically significant. Table 35 summarizes the indirect effects' results for the sub-sample of those students that followed at least one EE course before 2016.

[14] The regression tables for the analyses considering the EE sample split are available upon request to the authors.

Table 35. Mediation analysis, indirect effects (sub-sample: students that followed at least one EE course before 2016).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	-0.0121	0.0250	0.0610	0.0369
Ind2: Women →EI→EB	-0.0066	0.0371	-0.0795	0.0662
Ind3: Women →ATT→EI→EB	0.0418	0.0562	-0.1520	0.0684
Ind1: Women →SN →EB	0.0240	0.0274	-0.0298	0.0778
Ind2: Women →EI →EB	-0.0872	0.0688	-0.2220	0.0477
Ind3: Women →SN →EI →EB	0.0347	0.0284	-0.0209	0.0904
Ind1: Women →ESE →EB	-0.0105	0.0192	-0.0482	0.0272
Ind2: Women →EI →EB	0.0228	0.0568	-0.1343	0.0887
Ind3: Women →ESE →EI →EB	-0.0284	0.0406	-0.1079	0.0511
Ind1: Women →LoC →EB	0.0227	0.0285	-0.0332	0.0786
Ind2: Women →EI →EB	-0.0747	0.0642	-0.2005	0.0510
Ind3: Women →LoC →EI →EB	0.0252	0.0278	-0.0293	0.0798

Observations =409

Considering the second category of students (those who did not follow any EE courses), we confirm the results relating to the analyses on the whole sample. First, we found a negative and significant effect of being a woman on EB ($\beta = -0.3499$, $p < 0.1$); considering the mediation analyses, the only double serial mediation model confirmed is the one with ATT as the first mediator (Women → ATT → EI → EB; $\beta = -0.1497$, SE = 0.0614 IC [-0.2701; -0.0293]); in the other scenarios (considering the models with SN, ESE or LoC), only the simple mediation analyses with EI as a mediator are significant. Table 36 summarizes the indirect effects' results for the sub-sample of those students who did not follow any EE courses before 2016.

Table 36. Mediation analysis, indirect effects (sub-sample: students that did not follow any EE courses before 2016).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	-0.0024	0.0531	-0.1017	0.1065
Ind2: Women →EI→EB	-0.0276	0.0269	-0.0803	0.0250
Ind3: Women →ATT→EI→EB	-0.1497	0.0614	-0.2701	-0.0293
Ind1: Women →SN →EB	0.0004	0.0040	-0.0074	0.0082
Ind2: Women →EI →EB	-0.1672	0.0534	-0.2719	-0.0625
Ind3: Women →SN →EI →EB	-0.0093	0.0196	-0.0478	0.0292
Ind1: Women →ESE →EB	-0.0201	0.0196	-0.0584	0.0183
Ind2: Women →EI →EB	-0.1127	0.0427	-0.1964	-0.0289
Ind3: Women →ESE →EI →EB	-0.0398	0.0256	-0.0897	0.0101
Ind1: Women →LoC →EB	-0.0001	0.0024	-0.0047	0.0045
Ind2: Women →EI →EB	-0.1797	0.0559	-0.2892	-0.0701
Ind3: Women →LoC →EI →EB	0.0041	0.0135	-0.0223	0.0304

Observations =788

After these analyses, we show that the results drastically change between those women that followed at least one EE intervention before 2016 and those that not:

particularly, we found no statistically significant indirect effects for those students that followed an EE course before 2016, neither for the double-serial mediation path with ATT (Women →ATT→EI→EB).

Notably, EE can play a crucial role in empowering women to challenge gender stereotypes that traditionally associate entrepreneurship with a more masculine career choice (Entrialgo & Iglesias, 2016), and it can modify the cognitive processes that lead to EB. Indeed, EE programs can create a supportive environment where women can develop a sense of belonging in the entrepreneurial domain (Entrialgo & Iglesias, 2016).

Therefore, we hypothesize differences in cognitive processes for those women who followed an EE course from those that not.

Since students in the sample may have selected themselves into EE courses and programs, it is necessary to mitigate this self-selection bias. To do so, we propose the analyses splitting the sample into (i) students that followed EE before 2016 only as elective (147 students out of 409; 35.94%), (ii) students that followed EE before 2016 only as compulsory (212 students out of 409; 51.83%), (iii) students that followed both elective and compulsory courses before 2016 (50 students out of 409; 12.22%), and (iv) students that followed no EE interventions before 2016 (788 out 1,197). We use four dummy variables named *EEelective* (which takes the value of 1 if students followed an EE course or program as elective before 2016, and 0 otherwise); *EEcompulsory* (which takes the value of 1 if students followed an EE course as compulsory before 2016, and 0 otherwise); *EEboth* (which takes the value of 1 if students followed EE courses both as elective and compulsory, and 0 otherwise); and *noEE* (which takes the value of 1 if students followed no EE courses before 2016, and 0 otherwise). Then we run the analysis separately for the four different sub-samples. Table 37 summarizes the indirect effects' results for the four sub-samples.

Table 37. Robustness checks considering the types of EE students followed before 2016.
a) Mediation analysis, indirect effects (sub-sample: students that followed EE before 2016 only as elective).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	-0.0212	0.0770	-0.1720	0.1296
Ind2: Women →EI→EB	0.0021	0.0273	-0.0515	0.0057
Ind3: Women →ATT→EI→EB	-0.0103	0.0388	-0.0863	0.0657
Ind1: Women →SN →EB	0.0195	0.0401	-0.0596	0.0987
Ind2: Women →EI →EB	-0.0385	0.0859	-0.2068	0.1299
Ind3: Women →SN →EI →EB	0.0222	0.0353	-0.0470	0.0914
Ind1: Women →ESE →EB	-0.0029	0.0239	-0.0496	0.0439
Ind2: Women →EI →EB	-0.0100	0.0741	-0.1553	0.1353
Ind3: Women →ESE →EI →EB	-0.0057	0.0463	-0.0965	0.0851
Ind1: Women →LoC →EB	0.0652	0.0903	-0.1119	0.2423
Ind2: Women →EI →EB	-0.0732	0.0889	-0.2475	0.1010
Ind3: Women →LoC →EI →EB	0.0578	0.0445	-0.0295	0.1451

Observations =147

b) Mediation analysis, indirect effects (sub-sample: students that followed EE before 2016 only as compulsory).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	0.0152	0.0439	-0.0709	0.1013
Ind2: Women →EI→EB	-0.0593	0.0977	-0.2508	0.1321
Ind3: Women →ATT→EI→EB	-0.0587	0.1502	-0.3531	0.2356
Ind1: Women →SN →EB	0.0414	0.0531	-0.0626	0.1455
Ind2: Women →EI →EB	-0.1483	0.1276	-0.3984	0.1019
Ind3: Women →SN →EI →EB	0.0612	0.0556	-0.0476	0.1701
Ind1: Women →ESE →EB	0.0018	0.0276	-0.0523	0.0559
Ind2: Women →EI →EB	-0.0322	0.1164	-0.2603	0.1959
Ind3: Women →ESE →EI →EB	-0.0647	0.0898	-0.2407	0.1113
Ind1: Women →LoC →EB	0.0143	0.0390	-0.0620	0.0907
Ind2: Women →EI →EB	-0.1050	0.1214	-0.3430	0.1330
Ind3: Women →LoC →EI →EB	0.0198	0.0511	-0.0803	0.1199

Observations =212

c) Mediation analysis, indirect effects (sub-sample: students that followed EE before 2016 both as elective and compulsory).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	-0.0018	0.1934	-0.3808	0.3773
Ind2: Women →EI→EB	-0.0018	0.0194	-0.0399	0.0363
Ind3: Women →ATT→EI→EB	0.0002	0.0195	-0.0380	0.0383
Ind1: Women →SN →EB	-0.0338	0.0926	-0.2153	0.1477
Ind2: Women →EI →EB	-0.0164	0.1152	-0.2422	0.2095
Ind3: Women →SN →EI →EB	0.0243	0.0445	-0.0630	0.1116
Ind1: Women →ESE →EB	0.1725	0.2322	-0.2825	0.6276
Ind2: Women →EI →EB	-0.0163	0.0809	-0.1748	0.1421
Ind3: Women →ESE →EI →EB	0.0183	0.0880	-0.1542	0.1908
Ind1: Women →LoC →EB	-0.0404	0.1137	-0.2632	0.1825
Ind2: Women →EI →EB	0.0156	0.0611	-0.1042	0.1354
Ind3: Women →LoC →EI →EB	-0.0118	0.0402	-0.0907	0.0671

Observations =50

d) Mediation analysis, indirect effects (sub-sample: students that followed no EE interventions before 2016).

	Effect	BootSE	BootLLCI	BootULCI
Ind1: Women →ATT→EB	0.0024	0.0531	-0.1017	0.1065
Ind2: Women →EI→EB	-0.0276	0.0269	-0.0803	0.0251
Ind3: Women →ATT→EI→EB	-0.1497	0.0614	-0.2701	-0.0293
Ind1: Women →SN →EB	0.0004	0.0040	-0.0074	0.0082
Ind2: Women →EI →EB	-0.1672	0.0534	-0.2719	-0.0625
Ind3: Women →SN →EI →EB	-0.0093	0.0196	-0.0478	0.0292
Ind1: Women →ESE →EB	-0.0201	0.0196	-0.0584	0.0183
Ind2: Women →EI →EB	-0.1127	0.0427	-0.1964	-0.0289
Ind3: Women →ESE →EI →EB	-0.0398	0.0255	-0.0897	0.0101
Ind1: Women →LoC →EB	-0.0001	0.0024	-0.0047	0.0045
Ind2: Women →EI →EB	-0.1797	0.0559	-0.2892	-0.0701
Ind3: Women →LoC →EI →EB	0.0041	0.0135	-0.0223	0.0304

Observations =788

Again, we show that even though we split the sample considering the type of EE intervention students followed (i.e., elective, compulsory, both elective and compulsory), there are no statistically significant indirect effects; the model and particularly the double-serial mediation path with ATT (Women →ATT→EI→EB) is only confirmed for those students that did not follow any EE intervention before 2016.

4.5. DISCUSSION

Using the GUESSS longitudinal sample between the years 2016 and 2018, this research provides new theoretical and empirical insights by exploring gender differences and fully testing the TPB.

The results of the study revealed several key findings. Firstly, we found a significant and negative relationship between being a woman and the likelihood of engaging in EB (that is, have founded – active entrepreneurs – or were in the process of founding – nascent entrepreneurs – their own business) confirming H1. This suggests that women are less likely to pursue entrepreneurial activities compared to their male counterparts.

This is in line with the previous literature, affirming that being a woman negatively influences the implementation and perception of entrepreneurship (Bosma et al., 2012; Laguía et al., 2019; Santos et al., 2016; Shinnar et al., 2018). A possible explanation to this result is that entrepreneurship is still linked to traits such as aggression, success orientation, independence, challenge, and high risk-taking, traditionally associated more strongly with men (Ahl, 2006; Gupta et al., 2009; Laguía et al., 2019) and that the persistence of gender stereotypes and socially prescribed gender roles lead to a lower participation of women in entrepreneurship (Shinnar et al., 2018)

Then, we contribute to the existing literature by investigating whether the causes of this lower propensity of women towards EB reside in the cognitive antecedents such as ATT/SN/ESE/LoC and EIs through a double serial mediation and fully testing the TPB.

With our study we provide additional proof that intentions are a crucial predictor of behaviors (Ajzen, 1991); indeed, since the mediation analyses, that considered the cognitive antecedents (i.e., ATT, SN, ESE, LoC) as mediators of the relationship between being a woman and EB, are not statistically significant (respectively, H2a, H2b, H2c, H2d), we can affirm that is not enough that an individual has ATT, SN, ESE, or LoC to undertake the EB, but EIs are necessary.

Furthermore, we found that, when there is no full mediation (as in the model with ATT), EI mediates the relationship between gender and EB, confirming H3. The significant mediation of EI in the relationship between gender and EB suggests that women's lower likelihood of engaging in entrepreneurial activities is primarily influenced by their lower levels of EIs.

Then, the model with ATT as mediator 1 reveals a significant and negative relationship between being a woman and ATT, this suggests that women have a lower attitude toward start-up activities than men. Furthermore, we identified a double-serial mediation effect through the attitude-intentions path, confirming H4a. This indicates that

ATT influences EI, which in turn influences EB. Accordingly, women desired to engage in entrepreneurship to a lower degree, which contributed to their lower participation in entrepreneurial activities. Since men exhibit entrepreneurial traits to a larger extent than women, the latter demonstrates a mismatch between their attributes and actions required to become successful entrepreneurs (Haus et al., 2013; Maes et al., 2014; Nikou et al., 2019). Indeed, men tend to consider entrepreneurial activities positive because they have, more than women, traits associated with entrepreneurship such as success orientation, independence, challenge, and high risk-taking (Ahl, 2006; Gupta et al., 2009; Haus et al., 2013; Laguía et al., 2019; Pergelova et al., 2023). Consequently, this gender difference in personal attitude toward entrepreneurship shows that women are to a lower extent interested and attracted toward the entrepreneurial career (Antoncic et al., 2018; Maes et al., 2014; Verheul et al., 2012) and this also explains the differences in EI and subsequent EB.

Nevertheless, SN, ESE, and LoC did not double-mediate the relationship between gender, EI, and EB, suggesting that they are not significant factors in explaining the gender gap in Student Entrepreneurship.

The model with SN as mediator 1, reveals no significant relation between being a woman and SN while SN results significantly and positively related to EI. Consequently, the double serial mediation of being a woman on EB through SN and EI (i.e., H4b), is not supported. Nevertheless, according to Ajzen (1991) and in line with TPB, SN is a cognitive antecedent and a reliable predictor for EI, and EI is positively correlated with subsequent EB. In this case, women's lower entrepreneurial inclinations are not explained by SN: what does not lead women to EB is not related to the opinions and expectations of the individuals' close environment.

Furthermore, also the model with ESE as mediator 1, reveals no significant relationship between being a woman and ESE, while ESE results to be significantly and positively related to EI.

Also in this case, the double serial mediation of being a woman on EB through ESE and EI (i.e., H4c), is not supported showing that the reason why women do not translate their EI into actual EB is not related to their self-confidence in their entrepreneurial capabilities.

Finally, considering the model with LoC as mediator 1, again it reveals no significant relation between being a woman and LoC while LoC is significantly and positively related to EI. Again, the double serial mediation of being a woman on EB through LoC and EI (i.e., H4d), is not supported.

In conclusion, with respect to previous studies (Haus et al., 2013; Maes et al., 2014), students' gender (i.e., being a woman) no longer influences SN, ESE, and LoC, but it continues to affect ATT, which together with EI, double serially mediate the relationship between being a woman and EB.

Results highlight that women are less likely to engage in entrepreneurial activities not because they do not feel capable or legitimized, but specifically because they desire to do so to a lower degree.

Importantly, our research also investigates as post-hoc analysis the contingent effect of EE programs provided by universities on gender-related cognitive processes and subsequent EB, and particularly the gender stigma disappears for those students that followed EE. The results are significant only for students who did not participate in EE courses during their academic career and before 2016. This highlights the potential role of EE in shaping students' cognitive processes and subsequent EB. The findings suggest that EE programs may have a positive impact on reducing the gender gap in entrepreneurship by enhancing women's EI and EB. Nevertheless, further analyses are necessary to assess the causality of these relationships.

4.5.1. Contributions to theory and research

With this study, we contribute to the existing literature in several ways. Overall, this study contributes to the understanding of the gender differences in EB among university students; by applying the TPB framework, the study sheds light on the cognitive and behavioral dynamics underlying the lower entrepreneurial participation of women. We first fully tested the TPB using a longitudinal sample of university students and particularly assessing the intention-behavior link, which represents one of the most important research challenges in the entrepreneurial intention area (Fayolle & Liñán, 2014) but still underdeveloped (Fayolle & Liñán, 2014; Shinnar et al., 2018).

Then, we discovered that what leads to the fact that women have lower EIs and EBs is their ATT, highlighting that women engage in entrepreneurial activities to a lower

extent not because they do not feel capable or legitimized, but because they desire to do so to a lower degree. Accordingly, to encourage women entrepreneurship, it may be necessary to emphasize different career facets compared to men, such as strengthening personal motivations toward entrepreneurship.

Additionally, the findings emphasize the importance of EE in fostering ATT and EB, particularly for women.

4.5.2. Limitations and future research

This study is not without limitations, which also offers opportunities for future research.

First, this study is based on the initial part of the entrepreneurial journey; future research could therefore analyze how the above-mentioned mediators influence business growth over time. In fact, entrepreneurship is a process that passes through various stages and obstacles, and it is interesting to examine not only if gender influences the actualization of EB but also whether and how it affects the growth of the company over time.

Second, this longitudinal research is based on the time horizon between the years 2016 and 2018; it could be interesting to consider a time horizon comprising several years. This is because entrepreneurship is a time-consuming process and it is possible that, during this time, could change the personal dynamics and perceptions of ATT, SN, ESE, and LoC that individuals have.

Third, this study is based on a sample of university students. While using student-only samples in entrepreneurship offers several methodological advantages, it would be interesting if future research replicates the study using a different sample (i.e., adults), to increase the generalizability and external validity of the results.

Fourth, with this study, we put forward a first proposal on the effect of EE. Indeed, understanding the contextual reasons for contradictory findings of EE impact studies can provide insights into how EE programs can be tailored to address the specific needs and challenges faced by women in entrepreneurship (Nabi et al., 2017). Currently, however, there still may be some self-selection issues since, at the moment, we are not able to establish the causality of the EE effect. We know that EE may affect actual start-up behavior and strengthen the cognitive antecedents, especially attitude toward the behavior (Rauch & Hulsink, 2015), but further analyses considering contingency and comparative

explorations are necessary (Henry et al., 2016). Moreover, future research could further leverage the setting of student entrepreneurs and conduct detailed investigations on the role of universities as favorable environments for fostering and supporting entrepreneurship, with a specific focus on women. This entails examining the university climate and the support mechanisms that encourage students to actively participate in entrepreneurial activities as important contextual factors.

Fifth, as a variable to measure gender (i.e., being a woman) we used a binary variable considering individuals' sex and following the wake of other similar works (Shinnar et al., 2018; 2014; 2012). Nevertheless, future research could also consider gender non-binary and uses and/or develops a more precise measure that also considers stereotypes and the social construction of the concept of gender.

Sixth, in our analyses, we use the PROCESS macro by Hayes (2018) to test the double serial mediation model through the bootstrapping method to estimate indirect effects. Nevertheless, to test the causal relationship we suggest implementing the SEM technique and test the parallel mediation using all the variables of the model and not using stand-alone models. In addition, although mediation analysis is a valuable quantitative practice that allows us to understand the possible mechanism transmitting the impact of an antecedent variable on an outcome (Aguinis et al., 2017) trying to answer to the "*why*" question, further analysis using qualitative or mixed methods is suggested to understand the micro-dynamics underpinning the effect of gender on entrepreneurial behaviors.

Then, given the global nature of the GUESSS database, we suggest exploring the "*why*" question in different international contexts. Since in some countries additional support is required to assist women entrepreneurs in navigating the most challenging phase of business activities (GEM, 2023), a future research inquiry could consider the different countries students came from and differentiate between socially supportive and performance-based cultures (Stephan & Uhlaner, 2010). Specifically, on the one hand, performance-based culture refers to a cultural descriptive norm that emphasizes achievement, competition, and results; it is characterized by a focus on individual performance, goal orientation, and a high value placed on success and performance outcomes. Socially supportive culture, on the other hand, refers to a cultural descriptive norm that emphasizes cooperation, collaboration, and support for others; it is characterized by a focus on social relationships, community, and a high value placed on

helping and supporting others. These two dimensions of culture represent different ways societies prioritize and value certain behaviors and norms; both impact entrepreneurial behaviors, performances, and success (Stephan & Uhlaner, 2010). Therefore, future research could replicate the analyses implemented in our research and test the Theory of Planned Behavior through a double serial mediation model distinguishing between socially supportive and performance-based cultures and accounting for gender differences.

Last limitation is that this study does not consider the type of entrepreneurship or other context-specific issues in the analyses. Since prevalent stereotypes regarding men portray them as dominant, assertive, independent, self-confident, competitive, and ambitious, while stereotypes about women characterize them as sociable, relationship-oriented, helpful, sensitive, nurturing, affectionate, and sympathetic (Heilman et al., 2024), also the type of entrepreneurship and the industry in which men and women operate in could play a role. For instance, existing literature indicates that women often establish businesses with an environmental and/or social purpose, commonly referred to as social entrepreneurship (Loarne-Lemaire et al., 2017). To address this limitation, future research endeavors could explore the role of entrepreneurship types by specifically examining whether male and female students are more inclined to found businesses with a social purpose or not. This consideration would provide a more nuanced understanding of how gender stereotypes may intersect with the choice of entrepreneurial endeavors and industries. Another linked future research development regards the specific economic sector or industry in which men and women are mainly active: it has been demonstrated that women tend to operate into low-growth and low-skilled business sectors such as service or retail sectors (Gupta et al., 2009: Pergelova et al., 2023) while men tend to operate into high-performing and innovation-driving entrepreneurial sectors such as STEM fields (Kuschel et al., 2020; Pergelova et al., 2023). Therefore, future research needs to control also for the industry in which men and women have founded their business.

Lastly, future research endeavors may delve into investigating the underlying factors contributing to the development of women-specific career paths by expanding the scope of our research and conceptual framework to encompass various labor market domains and career trajectories.

4.5.3. Contributions to practice

The most impactful practical implication of this research is for the developers and designers of EE programs. We strongly encourage university practitioners and courses' developers to consider our findings when designing teaching methods that effectively enhance women's ATT. With our work, we provide a deeper comprehension of the differences between women and men in the cognitive processes leading to EI and EB, without which courses' designers risk creating generic interventions and practicing applicable to everyone and without adequately supporting women entrepreneurs (Nikou et al., 2019).

Indeed, as found by Souitaris et al. (2007), it is the inspiration that raises attitude and intention, increasing the likelihood that students will attempt an entrepreneurial career. Accordingly, new EE courses should focus and plan carefully how to inspire students toward an entrepreneurial career. The campaigns, but also the syllabus, that advertise entrepreneurial courses must be developed in the most inclusive way possible for women so that they perceive the entrepreneurial career more positively and therefore leading to an increase of their ATT and consequent EB.

4.6. CONCLUSION

Relying on TPB and by conducting a longitudinal study using data from the GUESSS project spanning from 2016 to 2018, we propose that being a woman negatively affects EB and we claim that this relationship is double serially mediated by ATT and EI.

Furthermore, we recognized the unique context of student entrepreneurs who benefited from the resources and support provided by their universities, particularly through EE courses and programs. We found that the effects of gender on cognitive processes and subsequent EB varied depending on whether students had participated in an EE course or not.

5. INVESTIGATING THE EFFECT OF ENTREPRENEURSHIP EDUCATION ON GOAL ORIENTATION: A GENDER PERSPECTIVE

ABSTRACT

Entrepreneurship Education (EE) for enterprising individuals has gained increasing attention in recent years as a means to foster innovation. While previous studies have primarily focused on the effect of these EE interventions on the development of entrepreneurial ideas or the performance of entrepreneurs' firms, and mostly via firm-level analyses, less attention has been given to individual personality characteristics and motivational states.

Goal Orientation (GO) is a valuable entrepreneurial personality characteristic that describes an individual's propensity to pursue different types of goals, but it is also associated with motivation and achievement in various other life domains. Therefore, understanding how EE can shape individuals' GO is important not only in the context of entrepreneurship but also in fields such as education and workplace organizations. Nevertheless, to the best of our knowledge, we lack contributions on how EE, and particularly different types, can shape individuals' GO.

In this study, we aim to address this gap by (i) examining how different educational interventions affect individuals' GO, and (ii) accounting for gender differences in this relationship, through a randomized control trial experiment involving 241 enterprising individuals who attended three different EE programs.

Keywords:
Entrepreneurship Education; Randomized Control Trial; Goal Orientation; Scientific Approach; Effectuation Approach; Gender.

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I want to express to the participants of the workshop for their insightful comments.

5.1. INTRODUCTION

Entrepreneurship Education (EE) for enterprising individuals[15]– that are individuals no longer university students in the process of creating and starting or managing a new venture – has gained increasing attention in recent years as a means of fostering innovation (Bacigalupo et al., 2016; McKenzie & Woodruff, 2014; Valerio et al., 2014). Nowadays, two EE interventions for enterprising individuals, differing for the type of contents taught during the course, are rising: the former based on the *Scientific Approach*, that is an EE intervention where enterprising individuals apply the scientific method to decision-making encompassing theory development, hypothesis testing, and evidence-based decision-making (Camuffo et al., 2020); and the latter based on the *Effectuation Approach*, that is an EE intervention where enterprising individuals learn how to make decisions regarding their business by leveraging their existing knowledge, resources, and skills putting the emphasis on performances step-by-step (Sarasvathy, 2001).

Previous studies on aforementioned topics have identified the effect of EE for enterprising individuals (as specific type of audience), on how they can shape the development of an entrepreneurial idea (Camuffo et al., 2020; Kotha et al., 2023; Novelli & Spina, 2022) or on the performance of their firms (Kotha et al., 2022; Novelli & Spina, 2022), yet mostly in business domains and via firm-level analyses.

Nevertheless, these EE interventions can impact other types of outcomes such as the development of entrepreneurial personality characteristics such as goal orientation, resilience, and perseverance that are crucial for entrepreneurs (Zolin, 2020).

Particularly, Goal Orientation (GO) – defined as individuals' predisposition or situational goal preferences in achievement settings (Dweck, 1986; Dweck et al., 1988; Payne et al., 2007; VandeWalle, 1997) – is an important aspect of entrepreneurial personality, that describes an individual's propensity to pursue different types of goals; it is associated with higher entrepreneurial outcomes such as entrepreneurial success and performances (Hagedoorn et al., 2023; Yoon & Cho, 2021), as well as entrepreneurial behaviors (Pidduck et al., 2023), intentions (Botha & Bignotti, 2017); moreover, it is also

[15] According to the literature, EE for enterprising individuals is usually named "Entrepreneurial Training Programs (ETP)" (Valerio et al., 2014). Particularly, what changes between EE and ETP is the audience: EE is mostly destinated to secondary education and higher education students, while ETP are destinated to enterprising individuals. Nevertheless, in this study we specifically rely on the conceptualization provided by Fayolle (2013) considering therefore the different types of audiences for EE avoiding any labelling to ETP.

associated with motivation and achievement in many other life domains (Dweck, 1986), playing an important role beyond venture creation. Specifically, GO can be conceptualized in a trichotomous model (VandeWalle, 1997): (i) learning GO, where individuals act as they do in order to acquire new competencies; (ii) performance-approach GO, where individuals act as they do in order to gain rewards and recognition from the others; (iii) performance-avoid GO, where individuals act as they do in order to avoid negative outcomes and judgments from the others.

According to the competence motivation psychology literature (Dweck, 1986; Dweck et al., 1988; Elliot et al., 2017; Payne et al., 2007), GO represents a motivational state and can vary from situation to situation depending on a variety of factors such as mood, task, and context. Moreover, according to the "Achievement Goal Theory" (Dweck 1986), GO can be shaped through educational interventions. Indeed, the existing body of knowledge has revealed that individuals' motivation is influenced by a range of factors: among others, the type of teaching methods they receive (Martin, 2008; Teven & Mccroskey, 1997).

However, to the best of our knowledge, no study investigates how EE – seen as a possible setting able to shape individual characteristics – impacts GO and particularly how different types of EE interventions (i.e., different approaches to the decision-making taught within EE) can shape individuals' GO.

Therefore, understanding GO as a possible outcome, and how it is shaped through EE is important for a wide range of fields and contexts, as it can inform the development of effective strategies and interventions for promoting success and growth in many fields and life domains.

Notably, different types of EE intervention, specifically those aimed at educating enterprising individuals at different approaches to decision-making (i.e., Scientific Approach and Effectuation Approach) are related to the three dimensions of individuals' GO, since GO refers to the "actions undertaken in the pursuit of achievement goals in specific situations" (DeShon & Gillespie, 2005; pp. 1120), thus embedded in the decision-making process itself.

Therefore, we believe that investigating GO as a motivational factor and personality characteristic is a worthwhile endeavor that is currently overlooked.

In addition, previous literature recommended to consider individuals' socio-demographic characteristics as contingent dimensions and examine how they influence EE outcomes (Nabi et al., 2017) and since gender can affect individuals' motivational characteristics (Martin, 2003; 2008) such as individuals' GO, it is important to incorporate such factor into the investigation. In this regard, we propose that the gender of individuals (Martin, 2003; 2008) represents an intriguing boundary condition that merits thorough examination.

Indeed, it is important to consider gender differences in the context of GO and EE: research has shown that gender can influence individuals' entrepreneurial learning, knowledge and self-efficacy, attitudes, intentions, and behaviors (Bergman et al., 2011; Cadenas et al., 2020; Nowiński et al., 2019; Shinnar et al., 2014, 2018), and in general personality characteristics and motivational states. Particularly, since women and men substantially differ in various cognitive functions (Florin et al., 2007; Joners et al., 2011; Xin et al., 2019; Ye et al., 2022), gender may influence how individuals respond to EE interventions and the extent to which their GO is shaped.

Thus, we formulate the following research questions: (i) what is the role of different approaches to the decision-making taught within EE interventions in shaping individuals' GO? (ii) does the impact of different approaches to decision-making taught within EE on GO of enterprising individuals vary depending on gender?

To address such questions, we base our analysis on a randomized control trial involving 241 enterprising individuals who attended different EE interventions. We randomly assign the individuals to two treatment groups or a control group. Entrepreneurs assigned to the treatment groups learned, respectively, how to use a scientific approach to decision-making or an effectuation approach to decision-making. On the other hand, the control group learned how to use the same entrepreneurial tools and best practices, but without following a scientific approach or an effectuation approach to decision-making. Through our analysis, we show that the EE interventions affect differently the GO (i.e., learning GO, performance-approach GO and performance-avoid GO) of enterprising individuals and that the types of contents they receive change their motivational orientation.

This research aims to make four main contributions. First, we offer contributions to the literature regarding the effects of EE on enterprising individuals (McKenzie &

Woodruff, 2014; Valerio et al., 2014). More precisely, previous literature has highlighted how EE can influence the performances of entrepreneurs (Camuffo et al., 2020, 2021; Novelli & Spina, 2022), or in general, how EE interventions influence learning outcomes mostly related to the entrepreneurial field (Martin et al., 2013; Nabi et al., 2017). In this study, we show that EE can also affect motivational characteristics of enterprising individuals.

Secondly, we offer contributions to the literature regarding the effect of teaching decision-making approaches to entrepreneurs (Camuffo et al., 2020, 2021). Previous literature shows how decision-making approaches can influence the business performances of entrepreneurs, such as the likelihood of terminating their idea or the revenue gained (Camuffo et al., 2020, 2021). In this study, we also show that teaching a specific decision-making approach can also influence the personal characteristics of individuals, such as the GO, and particularly that different decision-making approaches can influence in a different extent such dimension.

Third, we add the gender perspective to the aforementioned body of knowledge; by considering gender as a contingent dimension, we contribute to a more comprehensive understanding of how EE impacts individuals' GO, and we address the empirical gap in studying gender differences in EE intervention (Nabi et al., 2017), but also in GO and its implications in different contexts.

Finally, we offer also contributions for practice and insights for universities and other stakeholders involved in the design of EE for enterprising individuals no longer university students. Particularly, acknowledging the differing effects of EE approaches on GOs based on gender allows educators to create tailored and inclusive curricula, addressing the distinct needs and aspirations of both men and women.

5.2. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

5.2.1. Goal orientation and its evolution over time

GO refers to an individual's predisposition or situational goal preferences in achievement settings (Dweck, 1986; Dweck et al., 1988; Payne et al., 2007; VandeWalle, 1997). It is a mental and cognitive framework that shapes the individuals' interpretation and response to achievement situations (Dweck, 1986). Specifically, GO is defined as "the cluster of actions undertaken in the pursuit of achievement goals in specific situations" (DeShon &

Gillespie, 2005; pp. 1120) and it is a motivational self-regulatory construct that refers to the way individuals approach and prioritize achieving their goals (Payne et al., 2007; Uy et al., 2017).

The concept of GO has evolved over time, particularly in terms of how it was initially conceptualized (Dweck, 1986). According to the psychology literature and, specifically, the Achievement Goal Theory (Elliot et al., 2017), GO was initially conceptualized as a dichotomous construct with two distinct orientations: *mastery orientation* and *performance orientation* (Dweck, 1986).

Mastery-oriented individuals focus on improving their knowledge, skills, and abilities, and on learning new things. Individuals with a high level of mastery GO tend to be motivated by the intrinsic satisfaction of achieving a goal and value the process of learning and self-improvement (Dweck, 1986; Elliot et al., 2017). Then, performance-oriented individuals are more concerned with achieving a specific outcome or goal. Individuals with a high level of performance GO tend to be motivated by external factors such as recognition and rewards (Dweck, 1986; Elliot et al., 2017).

Moreover, it was believed to be a bipolar construct with mastery and performance GO at opposite ends of a continuum (individuals could not have simultaneously high or low both GOs) (Payne et al., 2007). Nevertheless, as research progressed, scholars began to question this dichotomous and bipolar perspective and recognize the multidimensional nature of GO. First, they realized that individuals could hold both mastery and performance GO simultaneously (Payne et al., 2007), depending on the context and specific goals at hand and acknowledging that individuals can possess varying levels of each orientation.

The evolution of GO continued with the work of VandeWalle (1997) proposing a trichotomous model of GO that included *Learning GO*, as well as two dimensions of *Performance GO*: a "*prove*" or "*approach*" dimension and an "*avoid*" dimension.

Learning GO (LGO) primary focus is acquiring new knowledge and skills, and individuals are motivated to learn and develop competencies through effort and persistence, they are focused on the process of learning, rather than the outcome and they are not afraid of failure or making mistakes (DeShon & Gillespie, 2005; Uy et al., 2017; VandeWalle, 1997). Performance-approach GO (P-approachGO) involves the desire to gain positive outcomes and rewards, such as high grades, recognition from others, and

favorable judgments. Particularly, individuals are motivated to outperform their peers and gain external recognition, they focus on external rewards and recognition, and their main aim is to acquire prestige-oriented competencies (DeShon & Gillespie, 2005; Uy et al., 2017; VandeWalle, 1997). P-avoidGO involves a focus on avoiding negative outcomes and judgments, such as low grades or criticism from others. Here, individuals are motivated to avoid failure or negative outcomes, they tend to not take risks to avoid mistakes, and this GO is considered limiting for their learning process because without taking chances they cannot learn from their experiences (DeShon & Gillespie, 2005; Uy et al., 2017; VandeWalle, 1997).

This trichotomous model provided a more comprehensive understanding of Performance GO by acknowledging the distinct motivational factors associated with seeking positive judgments and avoiding negative judgments.

Another important aspect is the trait-state debate (DeShon & Gillespie, 2005; Vandewalle et al., 2019): GO could be conceptualized as a state or as a trait (Payne et al., 2007); state GO refers to a person's current motivational state or mindset, it is temporary and can vary from situation to situation depending on a variety of factors such as mood, task, context, and environmental conditions (Payne et al., 2007; Vandewalle et al., 2019); otherwise, trait GO refers to a person's general tendency to be motivated by certain types of goals across situations and it is an enduring characteristic of a person's overall personality, it is a stable characteristic that tends to persist over time and across situations (Payne et al., 2007; Vandewalle et al., 2019). Indeed, although GO is commonly conceptualized as a trait, its theoretical foundation acknowledges that it can be triggered by a variety of contextual influences and factors such as educational interventions (Kozlowski et al., 2001).

In the current study, we conceptualized the GO using the trichotomous dimension (VandeWalle, 1997) and considered it as a state (Payne et al., 2007), hence we do not consider GO as fixed or permanent but, embracing Achievement Goal Theory (Ames, 1992; Dweck, 1986; Elliot et al., 2017; VandeWalle, 1997), we consider GO as a temporary motivational state that can vary and be shaped through educational interventions (Dweck, 1986; Elliot et al., 2017; Martin, 2005; 2008).

Specifically, our main goal is to understand whether EE can be considered an antecedent of GO and whether different types of approaches and contents taught during

an EE intervention can lead to different levels of GO. Indeed, the most recent literature review on this topic (Vandewalle et al., 2019) addresses and highlights the issue of insufficient empirical evidence to substantiate the antecedents of GO.

5.2.2. The importance of goal orientation and the role of education

In the past decades, GO has evolved from its roots in educational and social psychology, where it initially explained the behavior and performance of young individuals in academic (Dweck, 1986; Seijts et al., 2004; Vandewalle et al., 2019) and sports settings (Vandewalle et al., 2019), to becoming one of the most extensively studied theories of motivation (Elliot et al., 2017).

Hence, studying GO is important for two main reasons. Primarily due to its impact on various outcomes and final performances, such as learning, academic performance, task performance, and job performance (Payne et al., 2007). For instance, LGO is positively associated with self-regulatory processes like goal setting and task persistence, which facilitate learning and performance not only in academic settings (Giota & Bergh, 2021; Ye et al., 2022) but also in non-academic settings (Locke et al., 1981). This suggests that understanding and fostering LGO or P-approachGO can enhance performances by facilitating the acquisition of knowledge, skills, and abilities. On the other hand, P-avoidGO dimensions have been associated with intrusive thoughts that inhibit performance (Payne et al., 2007).

Secondly, due to its applicability in various life domains (Domurath et al., 2020; Vandewalle et al., 2019). Considering the entrepreneurship field, GO has gained much interest in recent years in understanding its impact on entrepreneurial behaviors (Pidduck et al., 2023), innovation behaviors (Zhen et al., 2022), entrepreneurial intentions (Botha & Bignotti, 2017), and venture performances (Bernardus et al., 2020; Hagedoorn et al., 2023; Kammerlander et al., 2015; Uy et al., 2017; Yoon & Cho, 2021). Nevertheless, GO is important also for non-entrepreneurial fields. For example, GO has gained prominence in the fields of organizational psychology and organizational behavior (March, 1991; Vandewalle et al., 2019): since organizations are increasing the pressure on their employees to develop and update their knowledge, skills, and abilities to cope with the challenges of today's job market and to modify their behaviors in response to high levels of changes, uncertainty, and complexity (Nguyen et al., 2023), understand the GO is a

promising research stream that could explain why individuals act as they do and adapt their behaviors to changes (DeShon & Gillespie, 2005).

Since each domain has unique goals, demands, and contextual factors, different GOs are more suitable for different domains: LGO is beneficial in domains that emphasize skill development and mastery, P-approachGO is relevant in competitive domains where individuals strive for favorable judgments, and P-avoidGO is important in domains where individuals aim to avoid negative judgments about their competence (Payne et al., 2007; VandeWalle, 1997; Vandewalle et al., 2019).

Therefore, by examining GO and how it can be shaped, researchers can gain insights into the factors that influence performances and identify strategies to improve final outcomes in many life domains.

Nevertheless, less is known about the antecedents that can shape the GO, particularly focusing on EE. Although several factors have been identified to contribute to the development of GO (i.e., cognitive ability, implicit theories of intelligence, need for achievement, personality characteristics, self-esteem, and self-efficacy) (Payne et al., 2007; Vandewalle et al., 2019), there is a need for further research to explore and understand other types of antecedents and their impact on GO.

Based on the previous literature on this topic and particularly the most recent meta-analyses and literature reviews (Payne et al., 2007; Sisk et al., 2018; Van Yperen et al., 2014; Vandewalle et al., 2019), they discuss various antecedents and outcomes of GO, without specifically mentioning (general or specific) education as a potential antecedent. For example, Payne et al. (2007) mapped, through their meta-analysis, the possible antecedents (i.e., cognitive abilities, implicit theory of intelligence, need for achievement, self-esteem, general self-efficacy, and Big Five of personality) and proximal and distal consequences of GO dimensions. They emphasize the need for more studies that explore the antecedents and outcomes of GO, including factors like beliefs about success, locus of control, fear of failure, and trait anxiety. Here, the role of education is not explicitly mentioned as a focal point of the investigation, but they considered education as a broader context of the studies included in the meta-analysis; specifically, they deliberately focused on studies conducted with adults in educational and occupational settings and intentionally excluding samples of children or adolescents and studies that examined tasks related to sports. Indeed, one important new direction is that future research should

extend the study of GO beyond adolescents in academic settings and explore its implications for adult populations (VandeWalle, 1997; Vandewalle et al., 2019).

Sisk et al. (2018) also conducted two meta-analyses, with 147 records, to examine the relationship between the growth mindset (i.e., the belief that intelligence and abilities can be developed through effort and learning) and academic achievement and to highlight the contingencies that affect this relationship, such as age, academic subject, study design, etc. Here, they considered the education as environment in which the abovementioned relationship occurs.

Van Yperen et al. (2014) reviewed 98 articles and, through a meta-analysis, the authors examined the relationship between self-reported achievement goals and performance outcomes in three achievement domains: work, sports, and education. Particularly, they considered education as one of the three achievement domains in which the GO dimensions were assessed as a possible moderator of the relationship. Hence, the findings contribute to understanding the importance of GO (also) in educational settings and shed light on how students' GO may influence their academic achievements.

Last, VandeWalle et al. (2019) is the most recent comprehensive review on GO discussing the progress made in understanding GO and highlighting future research areas. They explored the influence of personal characteristics, contextual factors, and cultural differences on GO and its outcomes, highlighting the role of GO in the domain of work and organizations. Also in this study, the authors do not specifically focus on education as a primary area of investigation.

Even though previous studies primarily focus on the outcomes and consequences of GO rather than its antecedents, education is recognized as an important context in which GO and Achievement Goal Theory (Elliot et al., 2017) have been applied.

We know that students' motivation can be influenced by education, particularly through the type of teaching models they receive (Martin, 2008; Teven & Mccroskey, 1997), but we have also some pieces of evidence in educational settings underlining the fact that specifically GO could be shaped through education. For instance, Wadsworth et al. (2013) conducted a study in which elementary physical education students were randomly assigned to either mastery-based or performance-based instruction revealing that the type of instruction had an impact on the students' performances (i.e., physical activity). Another example is the study by Smeding et al. (2013), in which a mastery-

based goal intervention was introduced for university students. The intervention aimed to reframe exams and assessment practices as an opportunity to learn and connect them with personal learning goals. The results of this study showed that the intervention had a positive impact on the student's socioeconomic status.

Last, the study by Kozlowski et al. (2001) examines the effect of mastery and performance training on multidimensional outcomes such as cognitive skills, self-efficacy, and adaptability emphasizing that these cognitive skills are needed in complex work landscapes and highlighting that GO-based training interventions are a promising research flow. Nevertheless, these studies do not consider GO as a possible outcome of the interventions but rather GO is embedded in the educational context and intervention which is designed through a mastery or a performance-oriented approach, highlighting that the GO can be taught in an educational intervention.

Similarly, Martin (2005; 2008) developed an intervention to enhance student motivation in high school, focusing on promoting mastery-based goals, self-regulated learning, and utility value. In this case, the motivation is the outcome of the educational intervention: the intervention had a positive effect on students' mastery GO (i.e., performance GO is not investigated in these studies) and academic achievement and on another set of outcomes such as students' self-efficacy, the perceived value of schooling, planning, study management, persistence, failure avoidance, etc. Overall, these studies suggest that educational interventions can shape students' GO and particularly, educational researchers and designers view academic settings as an environment capable of prompting various GOs and inducing mastery and performance orientations (Kozlowski et al., 2001).

Nevertheless, considering EE settings, we do not have many contributions. For instance, Overall et al. (2018) conducted a study focusing on business students in higher education and used GO as the independent variable to explain subsequent entrepreneurial intentions and behaviors; or the studies by St-Jean and colleagues (St-Jean et al., 2018; St-Jean & Tremblay, 2011; 2020) investigated the role of LGO in a business-mentoring program for entrepreneurs as the independent variable to explain the subsequent entrepreneurial self-efficacy and ability to recognize opportunities.

In general, we still lack a comprehensive understanding of the role of EE in shaping different levels of GO; in particular, contributions on this topic consider GO as static and not modifiable through education.

5.2.3. The role of decision-making approaches in Entrepreneurship Education and its impact on goal orientation

Since GO refers to the individual's predisposition in achievement settings and the subsequent actions that the individual takes to achieve his/her goal (DeShon & Gillespie, 2005), it is strictly related to decision-making. Understanding decision-making processes and styles – defined as the "learned, habitual response pattern exhibited by an individual when confronted with a decision situation" (Scott & Bruce, 1995; pp. 820) – is important both for researchers and practitioners to understand why individuals behave as they do, and why they engage in activities that could lead to high-risk and/or potentially damaging outcomes and consequences (Gulseven & Mostert, 2019).

Not only GO is an essential part of decision-making (Gulseven & Mostert, 2019), but it can influence decision-making by shaping the individual's approach to setting and pursuing goals (Aarkrog & Wahlgren, 2022; Gulseven & Mostert, 2019). There exists evidence of this relationship in educational literature (i.e., Aarkrog & Wahlgren, 2022), in managerial decision-making literature (i.e., Domurath et al., 2020), as well as in entrepreneurship literature (B. A. Mueller et al., 2017; Uy et al., 2017; Yoon & Cho, 2021). Hence, individuals with different GOs may weigh different factors when making decisions.

As a consequence, we suspect that teaching individuals a new approach to decision-making through EE has the potential to affect and shape their GO hypothesizing a reverse relationship: we believe that teaching (or not) a structured decision-making approach during an EE intervention provides individuals with a clear process for setting and pursuing their goals, can help them align their goals with their values and beliefs, enables them to assess potential risks and uncertainties associated with their goals, and empowers them to take control of their GO.

Nowadays, two EE approaches to decision-making are rising: the *Scientific Approach* to decision-making and the *Effectuation Approach* to decision-making. As scientists advance knowledge by testing theory-driven hypotheses, enterprising individuals can be trained to adopt a scientific approach to generate opportunities and

create new ventures (Camuffo et al., 2020). On the other hand, enterprising individuals using an effectuation approach to decision-making take a set of means as given and focus on selecting between possible effects that can be created with that set of means basing their decisions in order to limit the loss of profit and leveraging on unexpected scenarios (Sarasvathy, 2001).

Nevertheless, although this literature is still recent and growing (Novelli & Spina, 2022), the studies on the effect of EE interventions particularly that related to the study of how different approaches to decision-making (i.e., scientific vs. effectuation) impact outcomes, only focuses on entrepreneurial and start-ups' performances via firm-level analyses.

In this study, we try to understand how specific characteristics of EE intervention – such as teaching an approach to decision-making or not – of EE interventions affect the GO of enterprising individuals, via individual-level analyses.

We hypothesized that the participants enter with an entry-level of GO, and after exposure to different approaches to decision-making (i.e., Scientific Approach and Effectuation Approach) the GO shifts. Particularly, when individuals are faced with difficult decisions or unexpected outcomes, their GO may shift as a result of the decision-making process.

Entrepreneurship Education based on the scientific approach and the effect on goal orientation. The Scientific Approach to decision-making involves both cognitive and action-based components to address uncertainty (Novelli & Spina, 2022); it combines formulating a theory about the problem faced (cognitive component) with taking action to test and refine that theory (action-based component).

The Scientific Approach to decision-making consists of four main steps (Camuffo et al., 2021; Novelli & Spina, 2022). Enterprising individuals that adopt a Scientific Approach to decision-making first develop a theory, that is a cognitive representation of how their business generates value and which helps them understand the key dimensions of the problem and focus their attention. Second, they articulate the theory through clear, falsifiable hypotheses that help modularize the problem into smaller and more addressable blocks, reducing causal ambiguity and generating more innovative ideas. Third, they gather feedback through rigorous tests that provide valuable information to

distinguish between businesses with good and bad outcomes. Finally, they systematically and critically assess the evidence to find support for key hypotheses.

By combining these four elements, enterprising individuals can make more informed decisions based on logical reasoning and systematic testing, resolving the uncertainty associated with each choice (Camuffo et al., 2021; Novelli & Spina, 2022; Zellweger & Zenger, 2021). Indeed, this approach can result in better learning and the development of more effective strategies (Eisenhardt & Bingham, 2017; Novelli & Spina, 2022).

Therefore, enterprising individuals that belong to the group where EE contents were taught using the Scientific Approach, after the EE intervention, are likely to be more interested in understanding and learning the environment in which they operate; this approach emphasizes the importance of making conscientious decisions, rather than solely focusing on the final outcomes and performances, by placing significant emphasis on the decision-making process itself, starting from the individuals' objectives. Given that this approach entails comprehensive testing and analysis before arriving at a conclusive decision, it consequently shifts individuals' attention away from immediate performance-related rewards and towards the process that guides them in making well-informed decisions. Moreover, the Scientific Approach to decision-making asks entrepreneurs to focus their attention on the feedback raised from the market. Such feedback can prove their theory or falsify it. In the latest case, entrepreneurs need to revise their previous beliefs and revise their theory. Building on this, the Scientific Approach to decision-making emphasizes the role of negative feedback and highlights it as a great source of information (Felin & Zenger, 2009). In this vein, we expect that an EE intervention based on teaching such an approach will boost the LGO of such entrepreneurs. This result may occur given the emphasis of this approach on learning from experimentation and revising their previous belief of entrepreneurs. Such philosophy may lead entrepreneurs in feel more comfortable in learning and learning from their failure. Building on this, we believe that teaching a scientific approach to decision-making will boost the LGO of entrepreneurs.

Considering the performance orientation, we believe that both P-approachGO and P-avoidGO are negative with respect to the control group because individuals who followed the EE intervention based on the Scientific Approach to decision-making should

be more interested in testing before making a decision, they are less interested in gaining rewards but also less scared to fail. Particularly, the Scientific Approach might empower participants to develop a mindset that values informed decision-making over immediate gains or losses. As a result, individuals are more willing to explore different options, test hypotheses, and learn from both successes and failures, ultimately leading to decision-making based on more precise information.

After these considerations, we formulate the following hypotheses:

Hypothesis 1a. *Enterprising individuals that followed the EE course based on the Scientific Approach to decision-making, experience higher levels of LGO after the intervention with respect to those in the control group.*

Hypothesis 1b. *Enterprising individuals that followed the EE course based on the Scientific Approach to decision-making, experience lower levels of P-approachGO after the intervention with respect to those in the control group.*

Hypothesis 1c. *Enterprising individuals that followed the EE course based on the Scientific Approach to decision-making, experience lower levels of P-avoidGO after the intervention with respect to those in the control group.*

Entrepreneurship Education based on the effectuation approach and the effect on goal orientation. Considering the Effectuation Approach, the individuals start with a set of means, such as knowledge, resources, or skills, and focus on exploring various possible effects or outcomes that can be created with those means. In this case, the individuals that followed the EE intervention based on the Effectuation Approach to decision-making do not have a fixed goal in mind but rather generate multiple possibilities and choose the one(s) that make the most sense given the resources available (Sarasvathy, 2001). Here, enterprising individuals think in terms of affordable losses: they need to calculate the risks and are prepared to lose what they invest. In addition, the Effectuation Approach to decision-making encourages the creation of strategic partnerships and collaborations to create mutually beneficial opportunities, and also the adaptation and flexibility incentivizing to view surprises and unexpected events as potential sources of opportunity (Sarasvathy, 2001).

Therefore, enterprising individuals that belong to the group where EE contents were taught using the Effectuation Approach, after the EE intervention, are likely to be more interested in acting with the knowledge that they already possess and the means that

they already have; this approach emphasizes the importance of directly acting rather than learning how to perform, by placing significant emphasis on performances step-by-step.

As a result, individuals who participated in this EE intervention become more performance-oriented than learning-oriented; they will be interested in getting rewards step-by-step exploiting events and contingencies to transform them into opportunities. Furthermore, since in this process, they must set up how much they can lose, make decisions based on an acceptable level of loss, and build partnerships to better manage the uncertainty, their fear of failure should decrease after the intervention (Sarasvathy, 2001).

After these considerations, we formulate the following hypotheses:

Hypothesis 2a. *Enterprising individuals that followed the EE course based on the Effectuation Approach to decision-making, experience lower levels of LGO after the intervention with respect to those in the control group.*

Hypothesis 2b. *Enterprising individuals that followed the EE course based on the Effectuation Approach to decision-making, experience higher levels of P-approachGO after the intervention with respect to those in the control group.*

Hypothesis 2c. *Enterprising individuals that followed the EE course based on the Effectuation Approach to decision-making, experience lower levels of P-avoidGO after the intervention with respect to those in the control group.*

5.2.4. The moderating effect of gender

Previous research underlines differences between women and men in EE impact studies (Bergman et al., 2011; Bosio & Origo, 2020; Cadenas et al., 2020; Entrialgo & Iglesias, 2017; Feder & Nițu-Antonie, 2017; Ferreras-Garcia et al., 2022; Nabi et al., 2017; Nowiński et al., 2019; Padilla-Angulo et al., 2022; Rauch & Hulsink, 2015; Shinnar et al., 2014, 2018; Wilson et al., 2007) suggesting that generalize the effect of EE for all the attendees should be done with caution. On the other hand, gender might be a significant factor that can affect both decision-making processes and personality traits such as GO (Gulseven & Mostert, 2019).

Therefore, in this study, we also consider the moderation effect of gender that results to be a valuable moderator in GO studies (Huang, 2012).

Previous research has highlighted the attention toward the potential influence of gender on various cognitive functions: for example, studies have revealed differences between women and men in terms of problem-solving approaches, and decision-making processes (Xin et al., 2019), which can be attributed to variations in gender-specific cognitive mechanisms; but also differences in motivational development and aspects (Florin et al., 2007; Jones et al., 2011; Ye et al., 2022), entrepr(Entrialgo & Iglesias, 2016)itive antecedents (Entrialgo & Iglesias, 2016), and entrepreneurial behaviors (Shinnar et al., 2012, 2014, 2018).

Considering studies regarding GO and gender, results have been mixed (Giota, 2001; Giota & Bergh, 2021) or highlighted no gender differences on LGO (mastery), P-approachGO or P-avoidGO (Huang, 2012). For example, considering the mastery dimensions (i.e., LGO), often females show the highest interest in learning purely for the sake of learning itself (Holtbrugge & Mohr, 2010; Severiens & Ten Dam, 1994); yet, males exhibit a greater tendency toward preferring self-actualization (mastery) goals compared to females (Giota, 2001).

Females typically prioritize social aspects (Giota & Bergh, 2021) and strive for a satisfactory work-family balance, while males are expected to be more aligned with competitiveness, individualism, and economic goals (Eagly, 1987; Eagly et al., 2000; Wolter et al., 2019). Indeed, males often endorse status goals more than females do (Giota & Bergh, 2021) indicating a greater performance-approach orientation (Midgley et al., 2001). Therefore, males are more performance-approach-oriented than females, due to males' willingness to outperform others, obtain higher and positive outcomes, and gain prestige-oriented competencies. Conversely, females are more likely to have avoidant personalities compared to their male counterparts, they are more cautious and aware (Gulseven & Mostert, 2019). Nevertheless, still little is known regarding potential gender differences in relation to GO (Giota & Bergh, 2021).

Even if aforementioned studies' results concern a sample of young adolescents and not adults, we suspect that the same mechanisms persist in enterprising individuals and particularly that the type of EE intervention (i.e., Scientific Approach and Effectuation Approach) plays a role to explain the effect on GOs. Yet, our focus is not on the direct impact of gender on GO, but on the contingent impact that gender has in the relationship between EE interventions and GO.

Thus, considering that the Scientific Approach intervention, which aims to improve understanding of the operating environment in which enterprising individuals operate, and taking into account that women have a lower inclination towards self-actualization and mastery objectives (Giota, 2001), they prioritize social components (Giota & Bergh, 2021) and a satisfactory work-family balance, and they are less likely to be competitive, individualist and focused on economic goals (Eagly, 1987; Eagly et al., 2000; Wolter et al., 2019) than males, we hypothesize that women can benefit in a lower extent from this particular type of intervention. Particularly, we hypothesize that women may derive fewer benefits from the Scientific Approach concerning their LGO and P-approachGO (i.e., lower levels of both dimension with respect to their male counterparts) and rather increase their P-avoidGO.

For the same reasons mentioned above, we hypothesize the same effects for the Effectuation Approach intervention. Since the Effectuation Approach emphasizes the importance of acting rather than learning how to perform, and not to see failure as a defeat, again women can benefit from this specific intervention in a lower extent with respect to their male counterpart.

Hence, while we hypothesize that gender matters to the education-GO relationship we actually assume that the Scientific and Effectuation Approaches, when compared to the control group (where they learn entrepreneurship through a standard approach), have a similar consequences gender-wise.

After these considerations, we formulate the following hypotheses:

Hypothesis 3a. *Gender moderates the effect of following the EE course based on the Scientific Approach to decision-making on the LGO; after the intervention, the increase of LGO compared to the control group is lower for women compared to men.*

Hypothesis 3b. *Gender moderates the effect of following the EE course based on the Scientific Approach to decision-making on the P-approachGO; after the intervention, the decrease of P-approachGO compared to the control group is higher for women compared to men.*

Hypothesis 3c. *Gender moderates the effect of following the EE course based on the Scientific Approach to decision-making on the P-avoidGO; after the intervention, the decrease of P-avoidGO compared to the control group is lower for women compared to men.*

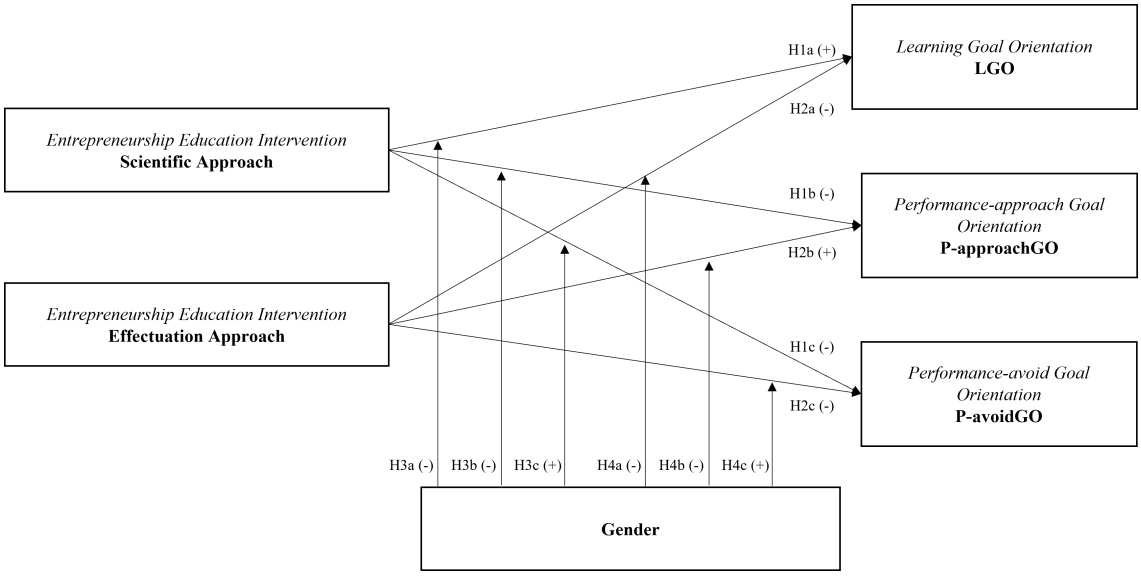
Hypothesis 4a. *Gender moderates the effect of following the EE course based on the Effectuation Approach to decision-making on the LGO; after the intervention, the decrease of LGO compared to the control group is higher for women compared to men.*

Hypothesis 4b. *Gender moderates the effect of following the EE course based on the Effectuation Approach to decision-making on the P-approachGO; after the intervention, the increase of P-approachGO compared to the control group is lower for women compared to men.*

Hypothesis 4c. *Gender moderates the effect of following the EE course based on the Effectuation Approach to decision-making on the P-avoidGO; after the intervention, the decrease of P-avoidGO compared to the control group is lower for women compared to men.*

The final framework is presented in Figure 10.

Figure 10. Conceptual framework.



5.3. METHOD

5.3.1. Study design

The study design is a randomized control trial experiment; similar to previous studies in this field (Camuffo et al., 2020), we randomly assigned enterprising individuals to three groups: treatment 1, where individuals followed the EE intervention based on the Scientific Approach to decision-making for developing entrepreneurial ideas (Camuffo

et al., 2020); treatment 2 where individuals followed the EE intervention based on the Effectuation Approach to decision-making (Sarasvathy, 2001); and a control group, where individuals followed the EE intervention based on how to develop an entrepreneurial idea without a specific decision-making approach (i.e, Standard Approach).

We used a longitudinal pre-/post-test design with two measurement waves (T1 and T2); the first measurement (T1) took place before the training and the second after the training (T2). Before starting the training, we required the participants to sign a statement acknowledging that the study was looking into the factors that influence the success of startups, that we were giving businesses management advice and training, and that we were also gathering data. Participants were aware that they were taking part in an activity for which we were providing a free service in exchange for the right to observe them for the sake of research and education. They were informed that the training program substance varied slightly across the sets of enterprising individuals. They were not aware of their membership in either the treatment groups or the control group, though. The statement was approved by the Ethical Committee.

5.3.2. Study context

We embedded the experiment inside an EE program offered by three Italian Universities. This program is designed as a pre-acceleration program aimed at individuals such as enterprising individuals with early-stage business ideas. The program took place from October 2020 to February 2021, spanning five months and offering 8 training sessions. The training sessions were led online, and they lasted a total of 24 hours. The primary objective of this pre-accelerator program is to assist startups in their initial stages by facilitating the development and testing of strategies, as well as the creation of viable and successful business models.

The program covers the following main topics: (i) the definition of a market need, (ii) business modeling through the business model canvas, and (iii) market validation. During the interventions, a series of activities aimed at testing the desirability of a product or service concept against a potential target market are performed. The content and length of each session were the same for each group but with different logic in the decision-making approaches.

The first treatment group learned to develop an entrepreneurial idea using the Scientific Approach to decision-making. Individuals in this group learned how to make decisions and solve problems through a systematic and scientific approach based on 5 pillars: (i) theory, that is the guiding light for entrepreneurs. Entrepreneurs draw a carefully designed theory about the decision they should take, linking all the possible components that can influence their outcome; (ii) hypotheses, that is describing in concrete terms (precise and falsifiable) which circumstance or factors may lead them to disconfirm their theory; (iii) evidence (systematic), that is testing hypotheses to be confuted or validated through data collection and subsequent analysis of them. Moreover, entrepreneurs lead their test on a relevant sample and use appropriate tools according to their hypothesis; (iv) evaluation, that is analyzing the results to determine whether or not the data supports the hypotheses through an unbiased analysis; and (v) decision, that is evaluating the results of the experiment using appropriate criteria (pre-determined thresholds) and make a decision which can be threefold (continue, change or abandon the business idea).

At the end of the course, individuals who have participated in the EE intervention based on the Scientific Approach will be able to learn and know as much as possible about the environment in which they operate and will need to question what they think they know, collect data to test their hypotheses to make targeted decisions through a critical evaluation of the results.

On the other hand, enterprising individuals assigned to the second treatment group learned to develop an entrepreneurial idea but using the Effectuation Approach to decision-making. Individuals in this group learned how to make decisions and solve problems through an approach based on 5 pillars: (i) bird-in-hand, that is starting with your means in a creative way to solve a problem or a need considering who are you, what you know, and whom you know; (ii) affordable loss, that is not focusing on how much you expect to gain but rather how much you can afford to lose; (iii) crazy quilt, that is reducing uncertainty by building partnerships with stakeholders who have an interest in seeing the business grow and building the market by focusing on strategic alliances rather than competitive analysis; (iv) lemonade, that is taking advantage of contingencies such as unforeseen events, meetings with new people and new information, to increase the means available and create new opportunities; and (v) pilot-in-the-plane, that is focusing

on the activities and aspects of the environment that you can directly control and can lead to desired results.

At the end of the course, individuals who have participated in the EE intervention based on the Effectuation Approach will be able to exploit events to transform them into opportunities starting from intuition, make decisions based on an acceptable level of loss, and develop the business through relationships with others.

Finally, the control group (i.e., Standard Approach) learned how to develop an entrepreneurial idea using the same tools as the two treatment groups, but without learning how to use these tools following a scientific approach or an effectuation approach. Particularly, individuals in this group learned how to make decisions and solve problems starting from (i) the validation of the market's problem/need, that is understanding if the problem you intend to solve is actually a problem for potential customers; (ii) the validation of the offer, that is understanding how to offer a product or a service that users and customers would use; and (iii) the validation of the solution, that is presenting a solution to customers, observe their reaction and understand how to improve the solution offered.

After the call for applications, our initial sample included 308 EE attendees. We divided the 308 attendees between the treatment groups and the control group. To test if the randomization was successful, we checked that each treatment group (102 attendees for treatment 1 and 105 attendees for treatment 2) and the control group (101 attendees) were balanced on several key covariates (among others, LGO, P-approachGO, P-avoidGO) at T1 that might affect the absorption of the treatments and subsequent outcomes. We did not find significant differences between the three groups, meaning that the three groups were equivalent before the training. We also avoid possible contaminations among the three groups following previous best practices used in field experiments regarding decision-making approaches (Camuffo et al., 2020).

Following rec(Ployhart & Vandenberg, 2010) design research (Ployhart & Vandenberg, 2010), the final sample is composed of the participants who took part in both measurement waves (T1 and T2) and answered the variables of our interest. The final sample includes 241 observations: 80 for the Scientific Approach treatment, 86 for the Effectuation Approach treatment, and 75 for the Standard Approach control group.

5.3.3. Measures

Dependent variables. Since we are interested in understanding how different EE interventions affect GO, we use the three different forms of GO as dependent variables.

We measured GO using VandeWalle's (1997) scale and readapted by Uy et al. (2017). Since the course was completely held in Italian, the survey and the scales were translated into Italian. We measured *Learning Goal Orientation (LGO)* by averaging 5-item 7-point Likert scale (α = 0.869). The items are: (1) I am willing to select a challenging work assignment that I can learn a lot from; (2) I often look for opportunities to develop new skills and knowledge; (3) I enjoy challenging and difficult tasks at work where I will learn new skills; (4) For me, development of my work ability is important enough to take risks; (5) I prefer to work in situations that require a high level of ability and talent.

We measured *Performance-approach Goal Orientation (P-approachGO)* by averaging 4-item 7-point Likert scale (α = 0.862). The items are: (1) I am concerned with showing that I can perform better than my coworkers; (2) I try to figure out what it takes to prove my ability to others at work; (3) I enjoy it when others at work are aware of how well I am doing; (4) I prefer to work on projects where I can prove my ability to others.

Last, we measured *Performance-avoid Goal Orientation (P-avoidGO)* by averaging 4-item 7-point Likert scale (α = 0.839). The items are: (1) I would avoid taking on a new task if there was a chance that I would appear rather incompetent to others; (2) Avoiding a show of low ability is more important to me than learning a new skill; (3) I am concerned about taking on a task at work if my performance would reveal that I had low ability; (4) I prefer to avoid situations at work where I might perform poorly.

Independent variables. We measure the different EE interventions using three dummy variables, one for each intervention. The variable takes 1 if the EE belongs to the specific intervention associated with the dummy and 0 otherwise. In particular, the three dummy variables are the following: (i) *Standard Approach*, (ii) *Scientific Approach*, and (iii) *Effectuation Approach*.

For our analysis, we used as the reference group the control group of the experiment (*Standard Approach*). Using a placebo control group, rather than a no-treated control group, is essential in these studies because it allows for measuring the relative effect of receiving a particular treatment in comparison to another "treatment" rather than

only measuring the absolute effects of receiving that specific treatment compared to no treatment at all; the placebo control group enables researchers to determine whether the effect on the dependent variable is caused by the specific characteristics of the t(Englis & Frederiks, 2023)ss of the treatment (Englis & Frederiks, 2023). Moreover, we test our independent variable using OLS regression.

Moderating variable. In the moderated model, the relationship between EE interventions and GO is conditional on the attendee's gender using the traditional binary variable following the wake of other similar works (Padilla-Angulo et al., 2021; Shinnar et al., 2014, 2018). We built a dummy variable named *Gender* equal to 1 if the respondent is a woman and 0 if the respondent is a man.

5.4. RESULTS

The mean values, standard deviations, and statistical correlations are reported in Table 38.

Firstly, we perform the *t*-test of the three types of GO pre- and post-EE intervention to understand if there exist significant statistical differences between GO before and after the EE intervention occurs. Table 39 shows the results regarding the paired-sample *t*-test.

Considering LGO, the results from the pre-test (M = 6.272, SD = 0.048) and post-test (M = 6.076, SD = 0.057) indicate that the EE intervention resulted in lower levels of LGO, $t(480) = 2.612$, $p = 0.009$.

Considering P-approachGO, the results from the pre-test (M = 4.215, SD = 0.090) and post-test (M = 4.367, SD = 0.092) indicate that the EE intervention resulted in no changes in the levels of P-approachGO, $t(480) = -1.182$, $p > 0.1$.

Considering P-avoidGO, the results from the pre-test (M = 2.329, SD = 0.075) and post-test (M = 2.594, SD = 0.081) indicate that the EE intervention resulted in higher levels of P-avoidGO, $t(480) = -2.403$, $p = 0.017$.

Table 38. Descriptive statistics and pairwise correlations.

Variables	T	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Gender[a]	T1	0.185	0.388	1.000											
(2) LGO	T1	6.267	0.728	0.038	1.000										
(3) LGO	T2	6.076	0.890	-0.045	0.284*	1.000									
(4) P-approachGO	T1	4.335	1.376	0.016	0.221*	0.089	1.000								
(5) P-approachGO	T2	4.366	1.420	0.086	0.033	0.230*	0.481*	1.000							
(6) P-avoidGO	T1	2.389	1.212	-0.062	-0.230*	-0.083	0.367*	0.256*	1.000						
(7) P-avoidGO	T2	2.594	1.262	0.016	-0.295*	-0.293*	0.098	0.332*	0.399*	1.000					
(8) Scientific Approach	T1	0.3311	0.471	0.053*	0.095	0.015	-0.017	-0.036	-0.081	-0.058	1.000				
(9) Scientific Approach	T2	0.331	0.471	-0.037	0.123	0.015	-0.049	-0.036	-0.057	-0.058	1.000*	1.000			
(10) Effectuation Approach	T1	0.340	0.474	0.129*	-0.020	-0.037	0.037	0.029	0.035	0.063	-0.320*	-0.525*	1.000		
(11) Effectuation Approach	T2	0.356	0.480	0.074	-0.040	-0.037	0.066	0.029	0.030	0.063	-0.525*	-0.525*	1.000*	1.000	
(12) Prior Startup Founded	T1	0.324	0.725	-0.037*	-0.023	-0.001	-0.106	-0.035	-0.038	-0.077	0.055*	0.082	-0.009	-0.022	1.000

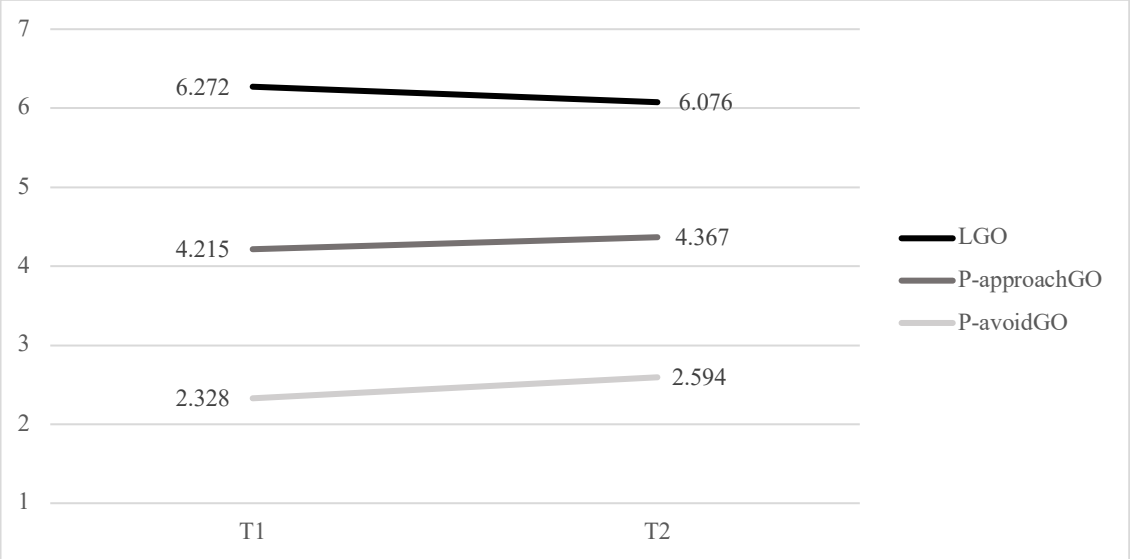
N: Obs (T1) = 308; Obs (T2) = 241
[a] 0 = Men; 1 = Women
** p <0.05*

Table 39. Paired-sample t-test results pre- and post-treatment.

	EE								
	Before			**After**			**Ha: Diff < 0**	**Ha: Diff = 0**	**Ha: Diff > 0**
Variables	*N*	*Mean*	*SD*	*N*	*Mean*	*SD*	*p-Value*	*p-Value*	*p-Value*
LGO	241	6.272	0.048	241	6.076	0.891	0.995	0.009	0.004
P-approachGO	241	4.215	0.090	241	4.367	0.092	0.119	0.238	0.881
P-avoidGO	241	2.329	0.075	241	2.594	0.081	0.008	0.016	0.991

In Figure 11 we plotted the means of the three types of GO (i.e., LGO, P-approachGO, P-avoidGO) over time.

Figure 11. Means of the GOs (i.e., LGO, P-approachGO, P-avoidGO) over time.



After this analysis is possible to affirm that there exist significant statistical differences between (a) LGO and (c) P-avoidGO before and after the EE interventions; there are no statistically significant differences for (b) P-approachGO before and after the EE interventions.

The table below (Table 40) reports the OLS regression used to test the relationship between interventions and GO. We clustered errors based on the treatment groups, and we control for possible differences in teaching styles by controlling for the mentors of the programs (Camuffo et al., 2020).

Table 40. Regression Analysis.

Variables	**Model 1** DV: *LGO*	**Model 2** DV: *P-approachGO*	**Model 3** DV: *P-avoidGO*
Scientific Approach	-0.010	-0.105*	-0.098**
	(0.220)	(0.069)	(0.033)
Effectuation Approach	-0.082***	0.062**	0.124***
	(0.005)	(0.029)	(0.007)
Constant	5.989***	4.706***	2.689***
	(0.000)	(0.002)	(0.005)
Observations	241	241	241
R-squared	0.016	0.022	0.008
Dummies for mentors	Yes	Yes	Yes
Clustered Errors	Intervention	Intervention	Intervention

*Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Model 1 shows the results of the effect of the Scientific Approach and the Effectuation Approach on the LGO.

As far as LGO is concerned, attendees who learn how to use the Scientific Approach to decision-making are not associated with different levels of LGO compared to the control group (Model 1: $\beta = -0.010$, $p > 0.1$). On the other hand, attendees who learned the Effectuation Approach to decision-making have lower levels of LGO compared to attendees in the control group (Model 1: $\beta = -0.082$, $p < 0.01$).

On a parallel ground, Model 2 shows the results of the two treatments on the P-approachGO. As far as P-approachGO is concerned, both treatments have a significant effect on this dimension. On the one hand, attendees who learn the Scientific Approach to decision-making have lower levels of this dimension after attending the training (Model 2: $\beta = -0.105$, $p < 0.05$). On the other hand, the Effectuation Approach has a positive and significative effect on the level of P-approachGO (Model 2: $\beta = 0.062$, $p < 0.05$).

Finally, Model 3 shows the results concerning the P-avoidGO. On the one hand, the Scientific Approach has a significant and negative effect on the P-avoidGO (Model 3: $\beta = -0.098$, $p < 0.05$). On a parallel ground, attendees who learned the Effectuation Approach to decision-making have a higher level of P-avoidGO (Model 3: $\beta = 0.124$, $p < 0.01$).

Then, we carried out the moderation analysis considering Gender as the moderator (Table 41: Model 4, 5, 6).

Model 4 considers the effect on *LGO*: it is observed that the coefficients of the interaction terms *Scientific Approach* x *Gender* (Model 4: $\beta = -0.664$, $p < 0.01$) and *Effectuation Approach* x *Gender* (Model 4: $\beta = -0.485$, $p < 0.01$) are both statistically and negatively significant.

Considering the effect on *P-approachGO*, only the interaction term *Scientific Approach* x *Gender* is negative and significant (Model 5: $\beta = -0.872$, $p < 0.01$).

Lastly, considering the effect on *P-avoidGO* (Model 6), we do not have statistically significant results for both interaction terms *Scientific Approach* x *Gender* and *Effectuation Approach* x *Gender.*

Table 41. Moderation Analysis.

Variables	**Model 4** DV: *LGO*	**Model 5** DV: *P-approachGO*	**Model 6** DV: *P-avoidGO*
Scientific Approach	0.097***	0.035	-0.137*
	(0.007)	(0.494)	(0.052)
Effectuation Approach	0.007	0.044**	0.087**
	(0.278)	(0.014)	(0.014)
Gender	0.299***	0.626***	-0.115
	(0.003)	(0.006)	(0.198)
Scientific Approach x Gender	-0.664***	-0.872***	0.244
	(0.001)	(0.009)	(0.112)
Effectuation Approach x Gender	-0.485***	-0.089	0.199
	(0.003)	(0.379)	(0.189)
Constant	5.938***	4.614***	2.709***
	(0.000)	(0.002)	(0.009)
Observations	241	241	241
R-squared	0.030	0.041	0.009
Dummies for mentors	Yes	Yes	Yes
Clustered Errors	Intervention	Intervention	Intervention

*Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

5.5. DISCUSSION

Based on the analysis, significant statistical differences exist between (a) LGO and (c) P-avoidGO before and after the EE interventions. However, there are no statistically significant differences for (b) P-performanceGO before and after the EE interventions. Nonetheless, further analyses are required to gain a better understanding of the differences among the EE interventions and their effects on GO.

The OLS regression results confirm that the individuals who followed the EE intervention based on the Scientific Approach to decision-making, after the intervention have lower levels of both P-approachGO and P-avoidGO, with respect to those who

followed the Standard Approach EE course. Therefore, hypotheses H1b and H1c are confirmed.

However, the analysis does not find a significant impact on LGO, hence hypothesis H1a is not confirmed. This outcome can be attributed to the emphasis placed on the learning process in both the standard and scientific approaches for evaluating and validating needs and ideas.

In the Standard Approach, individuals are encouraged to engage in a comprehensive learning process, which involves assessing various aspects of their business, identifying needs, and generating ideas. This approach aims to develop a deep understanding of the market and the viability of potential solutions. Similarly, the Scientific Approach also prioritizes the learning process: individuals learn how to gather data, analyze it, and draw evidence-based conclusions and subsequential decisions. This approach fosters a systematic mindset, enabling enterprising individuals to make informed decisions and validate their ideas before taking action.

On the other hand, the results confirm that the individuals who followed the EE intervention based on the Effectuation Approach to decision-making, after the intervention have lower levels of LGO and higher levels of P-approachGO, with respect to those who followed the Standard Approach EE course. Therefore, hypotheses H2a and H2b are confirmed.

However, the analysis does not support H2c since the effect of this EE intervention on P-avoidGO is positive. H2c states that enterprising individuals who followed the EE course based on the Effectuation Approach to decision-making would have lower levels of P-avoidGO compared to those who followed the Standard Approach EE course. However, the analysis did not support this hypothesis.

One possible theoretical reason for the positive effect on P-avoidGO could be because the Effectuation Approach encourages entrepreneurs to embrace uncertainty and view it as a natural part of the entrepreneurial journey emphasizing how to manage uncertainty and accept potential losses, but it does not completely eliminate the fear of failure. Individuals who learned the Effectuation Approach may still maintain a certain level of concern about potential failures, which consequently influence their levels of P-avoidGO. In this case, the Effectuation Approach may not have fully alleviated their fear of failure with respect to those who followed the Standard Approach. Actually, the

Effectuation Approach operates under conditions of uncertainty difficult to predict and control (Sarasvathy, 2001); on the other hand, the Standard Approach is based on causal reasoning, prediction, and control of final outcomes (March, 1991; Sarasvathy, 2001). Hence, even though the EE intervention based on the Effectuation Approach to decision-making teaches individuals to embrace uncertainty, the Standard Approach remains still most suitable for making enterprising individuals with lower levels of P-avoidGO and therefore less fearful of failure.

The obtained results from the moderation analysis provide valuable insights into the effect of gender on the relationship between following the EE course using the Scientific Approach or Effectuation Approach and GO. In terms of the effect on LGO, the interaction terms *Scientific Approach x Gender* and *Effectuation Approach x Gender* are both statistically and negatively significant confirming H3a and H4a. These findings are aligned with previous research that suggests women may have lower levels of LGO compared to men (Giota & Bergh, 2021). Theoretically, this may be attributed to the fact that women's inclination towards learning for learning's sake (Holtbrugge & Mohr, 2010; Severiens & Ten Dam, 1994) could not fit the adoption of the Scientific Approach and Effectuation Approach in the EE course, leading to a decrease in their LGO. Consequently, the Standard Approach in the EE intervention would appear to be more suitable for stimulating women's LGO compared to men.

Regarding the effect on P-approachGO, only the interaction term *Scientific Approach x Gender* is statistically significant and negative, confirming H3b but not H4b since the interaction term *Effectuation Approach x Gender* is not significant. Women show a decrease in P-approachGO when they follow an EE course based on the Scientific Approach. This finding suggests that the Scientific Approach may not align well with women's P-approachGO, leading to a decrease in this orientation. Men's higher interest in status goals and their inclination towards competitiveness, individualism, and economic goals (Eagly, 1987; Eagly et al., 2000; Wolter et al., 2019) could be influencing the observed decrease in women's P-approachGO when adopting the Scientific Approach, which might not fully align with their performance-oriented aspirations. Further research is needed to explore why this negative relationship exists; for example, it could be related to self-efficacy mechanisms that differ between women and men (Bandura, 1982; Eagly, 1987).

Lastly, for the effect on P-avoidGO, neither of the interaction terms, *Scientific Approach x Gender* and *Effectuation Approach x Gender*, are statistically significant; hence, H3c and H4c are not confirmed. This indicates that the impact of the EE course using the two approaches mentioned above on P-avoidGO, not only does not differ significantly between genders but could be a valuable mechanism to neutralize women's avoidant personalities.

5.5.1. Contributions to theory and research

This study contributes to theory and research in several ways. First, it provides new insights into the effects of EE interventions on individuals' GO beyond the traditional focus on entrepreneurial outcomes such as entrepreneurial performances, behaviors, or success (Martin et al., 2013; Nabi et al., 2017). By examining how different types of interventions affect individuals' GO, the study expands our understanding of the mechanisms through which EE influences enterprising individuals' mindset development.

Second, the study extends the application of GO with Achievement Goal Theory (Dweck, 1986; Elliot et al., 2017) beyond entrepreneurship to other life domains. The finding that GO can be actually influenced by EE has implications for education and workplace settings beyond entrepreneurship.

Moreover, this study provides empirical evidence on the impact of approaches to decision-making taught in EE interventions using rigorous design and shedding light on the causal mechanism of this relationship: the study's use of a randomized control trial design and the comparison of different interventions allows for the identification of the specific effects of each intervention on individuals' GO. This contribution is particularly timely due to the few experimental studies that have been conducted in the EE field (Blenker et al., 2014; Longva & Foss, 2018).

Afterward, this empirical evidence can inform the design and implementation of future EE interventions. Particularly, its focus on scientific and effectuation approaches contributes to the ongoing debate in the entrepreneurship literature on the effectiveness of different approaches to entrepreneurship.

Overall, this study adds to the growing body of research on the effectiveness of EE interventions and the importance of Achievement Goal Theory (Dweck, 1986; Dweck

et al., 1988; Elliot et al., 2017) in understanding not only entrepreneurial development but the individuals' success in many life domains that go beyond venture creation.

Considering the moderation analysis based on the gender of enterprising individuals, the findings highlight the importance of considering gender as a significant contingency in EE impact studies. Once again, this suggests that gender-specific factors influence how individuals respond to different approaches and contents taught during an EE intervention providing a more nuanced understanding of the contingency factors that shape final EE outcomes. Moreover, the findings suggest the need to refine and tailor EE approaches to accommodate gender-specific motivations and aspirations. Indeed, future research could explore how EE programs can be modified to better align with the GO of different genders, enhancing their effectiveness and relevance.

5.5.2. Limitations and future research

These results provide valuable insights into how different EE interventions can shape individuals' GO, but further research is needed to understand the underlying mechanisms and potential long-term effects.

Previous literature on entrepreneurship and GO, but also literature on EE, underlines the importance of entrepreneurial behavior as the final outcome. Indeed, according to Nabi et al. (2017), longitudinal studies related to intention-to-behavior (entrepreneurial) transition over time, and particularly those that focus on the impact that EE has in this process, are still needed. Moreover, a central part of decision-making is the ability of GO (Gulseven & Mostert, 2019). In educational settings, to understand students' dropout, it is important to understand students' decision-making processes leading to either leaving or staying in an educational program (Aarkrog & Wahlgren, 2022); since GO is an essential reason to keep under control when analyzing the dropout decision, a future direction could also be to understand how different GOs leads to the dropout of the entrepreneurial idea. Another important further research idea is to consider the different types of GO as a possible mechanism that explains the effect of the different EE interventions above mentioned and their effect on entrepreneurial behaviors and performances going to extend the works of Camuffo and colleagues (Camuffo et al., 2020, 2021).

Secondly, the study only looked at the short-term effects by analyzing the GO right after the training; nevertheless, the effects of the interventions on GO may fade or change over time in response to other external contexts or factors. Long-term follow-up studies could help address this limitation.

Third, we use as the final outcome a non-task-related measurement of GO, but also measuring GO as specific to the task and context at hand (Payne et al., 2007) could be valuable for further research to investigate.

Fourth, this study uses a placebo control group (Englis & Frederiks, 2023); indeed, individuals of this group received the same entrepreneurial tools and best practices with respect to Scientific and Effectuation treatment groups, because they followed the EE course as well as the others, but they did not receive the inputs about approaches to decision-making. Analyses including a control group that does not follow any EE course could lead to further developments and a more comprehensive understanding of GO.

Lastly, future research could move forward underlying possible mechanisms through which different EE interventions shape individuals' GO. Uncovering the antecedents of GO, especially within EE, including cognitive abilities, implicit theories of intelligence, need for achievement, self-esteem, general self-efficacy, and personality traits like the Big Five, beliefs about success, locus of control, fear of failure, and trait anxiety (Payne et al., 2007; Sisk et al., 2018; Van Yperen et al., 2014; Vandewalle et al., 2019), could inform strategies for optimizing outcomes in various life contexts.

5.5.3. Contributions to practice

The findings of this study provide important implications for practice as well, particularly for those involved in designing and implementing EE.

First, the study suggests that EE should be designed based on the GO of the participants. Specifically, those who have a higher need for achievement and are performance-oriented may benefit more from effectuation-based approaches, while those who have a more proactive approach to goals may benefit more from the Standard Approach. By tailoring the training programs to the participants' GO and expectations, the programs can be more effective in fostering the development of entrepreneurial skills and consequent behaviors.

Second, the study highlights the importance of considering the non-entrepreneurial outcomes of EE. The results show that the effect of the EE interventions

extends beyond just the development of entrepreneurial knowledge, skills, and behaviors and can also impact participants' motivation and achievement in many life domains. This suggests that EE can have broader benefits for individuals beyond just the context of entrepreneurship.

Third, by recognizing the differential effects of EE approaches on GO based on gender, educators and program designers can develop more tailored and inclusive curricula that address the unique needs and aspirations of both men and women.

5.6. CONCLUSION

EE has gained significant attention as a means of promoting innovation among enterprising individuals. While previous studies have focused mainly on the impact of EE interventions on entrepreneurial outcomes, there has been limited exploration of non-entrepreneurial outcomes and individual personality characteristics and motivations. One important personality characteristic is GO, which not only influences entrepreneurial goals but also plays a role in motivation and achievement in other areas of life. With this study, we provided empirical testing with a robust design to understand how EE, with its different types of teaching interventions and contents, can influence individuals' GO. In addition, we also considered gender differences in this relationship.

6. DISCUSSION

The main goal of this dissertation has been to contribute to the growing research on EE and its role within the Entrepreneurial Universities by developing empirical research aimed at understand the processes and antecedents, as well as the mechanisms and the contingencies that lead not only to the consequent entrepreneurial behaviors of women but also help understanding how women can benefit from EE.

Table 42 (Chapter 1), Table 43 (Chapter 2), Table 44 (Chapter 3), and Table 45 (Chapter 4) outline the dissertation articles focusing on contributions and possible future direction of each chapter.

Chapter 1 (*A systematic approach to the effects of entrepreneurship education: a literature review on task-related and non-task-related outcomes*) proposes an extension of the taxonomy by Marvel et al. (2016), taking into account the context of EE as a type of human capital investment, and categorizing EE outcomes into Knowledge, Skills, and Abilities. Furthermore, to the best of our knowledge, this is the first literature review that considers the task-relatedness of EE outcomes. The key finding is that the concept of non-task-related outcomes is recognized in the EE literature but is currently overlooked. Indeed, although the number of non-task-related outcomes (75 out of 143 outcomes) is higher than the number of task-related outcomes (68 out of 143 outcomes), not so many articles account for the non-task-related dimension: 26.9% of articles account for non-task-related outcomes, yet always consider and analyze in parallel the task-related dimension; it indicates that, despite conceptual efforts to explore non-task-related outcomes, the literature focuses on the task-related dimension.

Starting from the comprehensive literature review on EE impact studies, it has been possible to detect the new directions for further research that give birth to the three empirical articles of this dissertation. In the future directions list that emerged from the SLR, a set of initial ones is taken and addressed in this dissertation.

Specifically, Chapter 2 (*Teaching models and learning outcomes in entrepreneurship education: the role of students' and enterprising parents' gender*) builds on three main literature gaps identified in Chapter 1 (see Table 42, Column *Future directions*): (2.a.) ***New contingencies – different pedagogies methods, contents, and teaching models*:** since Chapter 2 employs as independent variable the teaching models taught within EE interventions; (2.b) ***New contingencies – gender differences***: since

Chapter 2 employs as moderator variable the students' gender. (2.c) ***New contingencies – other contingencies***: since Chapter 2 employs as sample split variable the gender of self-employed parents (where existing).

In addition, the outcomes investigated in Chapter 2 are the entrepreneurial learning outcomes defined as knowledge, skills and abilities considering the task-related dimension and only via students' self-evaluated assessment of learning.

The empirical analysis of this study is based on the sample of Italian university students who took part in the GUESSS 2018: specifically, it is a cross-sectional empirical design that examines the role of EE (and different types of teaching models) in strengthening the entrepreneurial LO.

The findings support that teaching models matter in the learning process, but the way they matter actually depends on the individuals' characteristics, particularly the gender of students and the gender of his/her self-employed parent(s).

In general, women report lower levels of entrepreneurial learning outcomes when compared to men, and, surprisingly, this decrease is more pronounced in practice-oriented teaching models; moreover, such a pattern is inverted (i.e., women tend to have higher levels of entrepreneurial learning outcomes, especially from practice-oriented teaching models) when women have only a self-employed mother and not a self-employed father.

Then, Chapter 3 builds on four main literature gaps identified in Chapter 1 (see Table 42, Column *Future directions*): (2.c) ***New dependent variables – entrepreneurial behaviors***: since Chapter 3 employs as dependent variable the entrepreneurial behavior, specifically considering the transition from entrepreneurial intentions into entrepreneurial behaviors through a longitudinal study; (2.b) ***New contingencies – gender differences***: since Chapter 3 employs as independent variable the students' gender; (2.a) ***New contingencies – different pedagogies methods, contents, and teaching models***: since Chapter 3 (in the post-hoc analysis) compares compulsory vs. elective interventions; (4.d) *New settings - country*: since Chapter 3 performs analysis using a sample of individuals from different countries.

In addition, the outcomes investigated in Chapter 3 are the attitude toward the entrepreneurial behavior, subjective norms, entrepreneurial self-efficacy, locus of control, entrepreneurial intentions, and entrepreneurial behaviors considering the task-related dimension.

Chapter 3, fully testing the Theory of Planned Behavior through a double serial mediation model and a longitudinal analysis using the merged GUESSS dataset 2016-2018 (global dataset).

The results highlight that being a woman is negatively associated with the likelihood of engaging in entrepreneurial behaviors and that this relationship is double serially mediated by attitude and entrepreneurial intentions (while subjective norms, self-efficacy, and locus of control - albeit predicting intention - do not mediate the woman-behavior link). Results highlight that women are less likely to engage in entrepreneurial activities not because they do not feel capable or legitimized, but specifically because they desire to do so to a lower degree.

In addition, in this study we perform also a post-hoc analysis aimed to understand whether these effects of gender on cognitive processes and consequent entrepreneurial behaviors are different for those students who followed an EE course and not (and particularly considering whether the EE was elective or compulsory). Results show that if we split the sample considering the type of EE intervention students followed (i.e., elective, compulsory, both elective and compulsory), there are no statistically significant indirect effects; the model and particularly the double-serial mediation path with the attitude-intention path is only confirmed for those students that did not follow any EE intervention.

Last, Chapter 4 builds on four main literature gaps identified in Chapter 1 (see Table 42, Column *Future directions*): (1.a/d): ***New dependent variables – non-task-related outcomes*:** since Chapter 4 employs goal orientation (i.e., learning goal orientation, performance-approach goal orientation, and performance-avoid goal orientation) as dependent variable, defined as a personality characteristic that describes an individual's propensity to pursue different types of goal, specifically considering the non-task-related dimension; (2.b) ***New contingencies – gender differences***: since Chapter 4 employs as moderator variable the students' gender; (2.a) ***New contingencies – different pedagogies methods, contents, and teaching models*:** since Chapter 4 compares different contents taught during the EE interventions (i.e., scientific approach to decision-making and effectuation approach to decision-making); (3.b) ***Method and design - experimental designs***: since Chapter 4 employs as design a randomized control trial to assess causality; (4.b) ***New settings – non-students as audience***: since Chapter 4 employs

an EE setting where the audience is composed of enterprising individual (defined as individuals in the process of creating and starting or managing a new venture).

The empirical context relies on an experiment embedded in an EE program offered by three Italian Universities. The EE program is designed as a pre-acceleration program aimed at individuals such as enterprising individuals (i.e., adults, no longer university students) with early-stage business ideas.

Results highlight that the EE interventions affect differently the goal orientation of enterprising individuals, particularly that the types of contents they receive change their motivational orientation, and the gender of individuals acts as contingency.

Table 42. Outline of dissertation articles - Chapter 1: A systematic approach to the effects of entrepreneurship education: a literature review on task-related and non-task-related outcomes.

Contributions	**Future directions**
1. **Critical systematization of EE impact studies**: a. Adding to the existing literature on EE by critically systematizing outcomes analyzed in EE impact studies. b. Emphasize the importance of assessing outcomes beyond cognitive dimensions and not directly associated with the venture tasks. c. Identify new literature gaps that lead to future research avenues. d. Advocate for rigorous methodologies such as experiments and quasi-experiments in studying diverse aspects of EE impact. 2. **Rethinking the impact of EE**: a. Revise the conceptualization of the impact produced by education, one of the core and strategic activities of the Entrepreneurial University. b. Highlight the potential of EE to develop non-cognitive skills and abilities that contribute to success in various life domains, extending beyond traditional views limited to venture tasks. c. Argue for the strategic importance of EE across different academic disciplines, emphasizing the broader value EE can bring to individuals beyond the scope of venture creation. 3. **Broader contributions to entrepreneurship literature**: a. Provide a broader perspective on the impact of EE by suggesting that exposure to entrepreneurial challenges, even in the classroom setting, contributes to individuals' personal development, not limited to the entrepreneurial career.	1. **New dependent variables**: a. **Non-task-related outcomes** (in general): the relationship between EE and non-task-related outcomes and boundaries is still lacking in empirical evidence and theoretical development. b. **Knowledge as a key outcome**: verifying that participants in EE courses have acquired key knowledge also through objective measurement methods, not just self-evaluation. c. **Entrepreneurial behaviors**: more research is needed on entrepreneurial behaviors specifically considering the transition from entrepreneurial intentions into entrepreneurial behaviors. d. **Non-task-related abilities**: more research is needed aimed to investigate traits of personality such as the Big Five, motivational aspects, and non-cognitive dimensions as outcomes of EE. 2. **New contingencies**: a. **Different pedagogies methods, contents, and teaching models**: the study suggests comparing and evaluating various EE interventions, considering teaching models, pedagogical methods, and course contents, but also comparing compulsory vs. elective interventions. b. **Gender differences**: the study suggests comparing and evaluating whether EE reaches men and women differently on a range of outcomes. c. **Other contingencies**: such as the role of the enterprising family, the role of the entrepreneurial climate and culture at the university, and regional factors such as cultural, social, political, infrastructural, and financial contingencies. 3. **Method and design**: a. **Qualitative and mixed methods**: the study recommends using qualitative and mixed methods to study the impact of EE on outcomes to gain a deep understanding of the impact of EE since the majority of empirical articles are based on quantitative methods. b. **Experimental designs**: since there is a strong lack of robust experimental or quasi-experimental design studies, the study recommends using experimental designs to assess causality. c. **Level of analysis**: there is a need for study at the meso- and macro-level, not only the micro-level or individual level. 4. **New settings**: a. **Non higher education students as audience**: there is a need for studies in new settings and contexts, such as primary and secondary school settings, and not only in higher education. b. **Non-students as audience**: there is a need for studies in new settings and contexts and not only considering students as EE audience, for example considering adults (i.e., potential, nascent, or practicing entrepreneurs) no longer university students. c. **Audience's field of study**: there is a need for research in other fields of study different from Business and Economics, for example with students belonging to the Social Sciences and Psychology area, also to widespread EE in all faculties and subject areas. d. **Country**: since there is a strong bias toward European contexts, the study suggests performing analysis using a sample of individuals from different countries.

Table 43. Outline of dissertation articles - Chapter 2: Teaching models and learning outcomes in entrepreneurship education: the role of students' and enterprising parents' gender.

Contributions	**Future directions**
1. **Integrating teaching models and entrepreneurial learning outcomes from a human capital perspective**: a. Highlight the link between teaching models and learning outcomes. b. Apply Human Capital Theory to explain the impact of teaching models on entrepreneurial learning outcomes. c. Conceptualize the different teaching models as different types of human capital investments. d. Proposes integration of Béchard & Grégoire's (2005) EE teaching models with Marvel et al.'s (2016) Human Capital Theory for interpretation. 2. **Gendered effects of teaching models on entrepreneurial learning outcomes**: a. Empirically demonstrate that women and men respond differently to various EE teaching models. b. Apply gender stereotypes theory to explain gender-based differences in cognitive processes and learning styles. c. Suggest that women may achieve lower levels of learning outcomes in more practice-oriented teaching models due to potential gender biases in EE courses. d. Advocate for a more gender-inclusive approach in EE to overcome stereotypes and enhance women's engagement in entrepreneurship. 3. **Parental influence on entrepreneurial learning outcomes from a social cognitive perspective**: a. Emphasize the role of self-employed parents' gender in shaping entrepreneurial learning outcomes for women and men and showing that having a self-employed mother positively influences women's learning outcomes, acting as a mitigating factor against gender stereotypes. b. Apply Social Cognitive Theory to explain how individuals observe and imitate same-gender models.	1. **Methodology**: a. Explore diverse methodological approaches beyond cross-sectional studies for a comprehensive understanding of the relationship between teaching models and entrepreneurial learning outcomes. b. Conduct pre-/post-test experimental or quasi-experimental designs to establish causality more rigorously. c. Conduct qualitative interviews aimed to gain deeper insights into the dynamics, specifically exploring the reasons behind women's lower entrepreneurial learning outcomes in practice-oriented teaching models compared to men. 2. **Intersectionality and cross-cultural investigation**: a. Investigate the intersectionality of various identity factors (e.g., gender, race, socioeconomic status) in order to explore how the intersectionality of identity characteristics may influence the effectiveness of different teaching models. b. Replicate the study in various cultural and academic contexts (not only the Italian context), different social ecosystems, and across different countries to assess the generalizability of results. 3. **Enhance variable measurement**: a. Move beyond dichotomous variables for teaching models and exposure to an entrepreneurial family, considering a more nuanced analysis. 4. **Sample distribution and homogeneity**: a. Address the non-uniform distribution of observations in various courses and teaching models, ensuring a more evenly distributed sample. b. Replicate the study with a sample that is more representative in terms of the number of students, gender distribution, and parental self-employment. 5. **Temporal considerations**: a. Investigate the time elapsed between the end of EE interventions and respondents' assessment of entrepreneurial learning outcomes also exploring the impact of EE immediately after the course. 6. **Other outcome measures**: a. Broaden the scope of outcomes beyond entrepreneurial learning outcomes, including measures such as entrepreneurial knowledge, skills, abilities, attitudes, career intentions, and entrepreneurial behaviors to assess the impact of different EE teaching models. b. Consider alternative evaluation methodologies, such as diaries or reflective essays, to complement self-evaluation in assessing the impact of different teaching models on learning. 7. **Gender stereotypes in EE courses**: a. Investigate gender stereotypes within EE course programs, analyzing syllabi language and content in order to explore ways to enhance gender inclusivity in EE courses by identifying and modifying language and content that may contribute to stereotypes.

Table 44. Outline of dissertation articles - Chapter 3: Why do women (not) become entrepreneurs? The role of students' cognitive processes.

Contributions	**Future directions**
1. **Exploration of gender differences in entrepreneurial behaviors and cognitive processes**: a. Provide a theoretical and empirical explanation for the gender gap in entrepreneurship using the Theory of Planned Behavior to explore cognitive and behavioral dynamics. b. Highlight that the gender gap is not rooted in perceived capability or legitimacy but stems from lower desire for entrepreneurial activities among women. c. Provide a deeper comprehension of cognitive processes leading to intentions and behaviors differences between women and men. 2. **Addressing research gaps in entrepreneurial intentions area**: a. Contributes to filling the gaps in the entrepreneurial intention area, specifically focusing on the overlooked intention-behavior link through a longitudinal study. 3. **Implications for encouraging women entrepreneurship**: a. Encourage developers and designers of EE programs to consider gender-specific cognitive processes when designing teaching methods to effectively enhance women's attitudes. b. Recognize the unique context of student entrepreneurs benefiting from university resources and support, particularly acknowledging the role of EE in understanding the effects of gender on cognitive processes and subsequent entrepreneurial behaviors.	1. **Analysis of the entrepreneurial journey**: a. Explore how gender dynamics affect not only the entrepreneurial behavior but also the business growth over time and over various entrepreneurial stages and obstacles. 2. **Extend the time horizon**: a. Recognize the time-consuming nature of entrepreneurship and its potential impact on individuals' cognitive processes and subsequent entrepreneurial behaviors considering a longer time horizon. 3. **Different sample**: a. Replicate the study with a sample beyond university students (such as adults) to enhance generalizability and external validity of results. 4. **Go in-depth in understanding the EE effect**: a. Investigate the causal relationship – through experimental designs – between EE and actual start-up behavior, especially in strengthening cognitive antecedents like attitude toward the behavior. b. Conduct detailed investigations into the role of universities – through university climate and support – as favorable environments for fostering and supporting entrepreneurship. 5. **Refined gender measurement**: a. Develop a more precise measure of gender that goes beyond binary classification, considering nuances related to stereotypes and the social construction of gender. 6. **Approach and methodology**: a. Implement SEM techniques to test the double serial mediation model and assess the causal relationships among variables moving beyond standalone models and using parallel mediation testing for a more comprehensive understanding of the studied relationships. b. Expand the research using qualitative or mixed methods to fully understand the micro-dynamics underpinning the effect of gender on entrepreneurial behaviors. 7. **Exploring country differences**: a. Exploring the "why" question in different contexts specifically considering the different countries students came from and differentiating between socially supportive and performance-based cultures. 8. **Entrepreneurship types and industry focus**: a. Explore whether male and female students exhibit preferences for founding businesses with a social purpose, aligning with existing literature indicating women's inclination towards social entrepreneurship. b. Controlling for factors such as industry/sectors in which men and women operate in. 9. **Exploring other career paths and trajectories**: a. Extend the research scope to investigate the underlying factors contributing to the development of women-specific career trajectories across various labor market domains.

Table 45. Outline of dissertation articles - Chapter 4: Investigating the effect of entrepreneurship education on goal orientation: a gender perspective.

Contributions	Future directions
1. **Contribution to EE literature**: a. Expands existing literature on EE effects by highlighting its influence on motivational characteristics, going beyond traditional entrepreneurial (or task-related) outcomes and contributing to a more comprehensive understanding. 2. **Contribution to decision-making research**: a. Extend literature on decision-making approaches, showing that teaching specific approaches influences personal characteristics, specifically goal orientation. 3. **Gendered effects of EE contents on goal orientation**: a. Empirically demonstrate that women and men respond differently to various contents taught within EE interventions. b. Emphasize the need to consider gender as a significant contingency in EE impact studies, providing nuanced insights into factors shaping EE outcomes, and particularly advocating for more tailored and inclusive curricula to meet unique needs of both genders. 4. **Contribute to Achievement Goal Theory**: a. Extends the application of goal orientation within Achievement Goal Theory in the EE literature, which is currently overlooked. b. Empirically demonstrate that goal orientation can be shaped through educational interventions and that education is an antecedent of goal orientation. 5. **Methodology**: a. Add empirical evidence on how EE interventions influence the outcomes using a rigorous design.	1. **Longitudinal studies on entrepreneurial behavior**: a. Address the gap in the literature by conducting longitudinal studies on the transition from entrepreneurial intention to behavior over time and subsequent entrepreneurial performances, specifically focusing on the role of EE in this process and goal orientation as a possible mechanism. b. Investigate the impact of different goal orientations on the dropout decision in educational programs, particularly in the context of EE, extending the understanding of factors influencing entrepreneurial persistence. 2. **Long-term effects of EE interventions**: a. Address the limitation of short-term focus by conducting long-term follow-up studies to understand how the effects of EE interventions on goal orientation evolve or change over time. b. Examine how external contexts or factors may influence the persistence or alteration of the impact of EE interventions on individuals' goal orientation. 3. **Task-specific measurement of goal orientation**: a. Explore the value of measuring goal orientation as specific to the task and context at hand, providing a more nuanced understanding of how EE interventions influence task-related goal orientation. b. Consider both non-task-related and task-specific measurements to capture the multidimensional nature of goal orientation. 4. **Control group analysis**: a. Enhance the study design by including analyses with a control group that does not follow any course, allowing for a more comprehensive understanding of the specific effects of EE interventions on goal orientation. 5. **Understanding underlying mechanisms**: a. Conduct further research to investigate the underlying mechanisms through which different EE interventions shape individuals' goal orientation.

In sum, the gender lens is always present in this dissertation: from the analyses of the EE impact studies sampled in the SLR, a call for additional studies that consider gender differences is urgent (Nabi et al., 2017). Previous literature underlines that EE can reach men and women differently (Shinnar et al., 2018) and that there exist contradictory findings in EE impact studies (Bae et al., 2014; Martin et al., 2013; Nabi et al., 2017; Rideout & Gray, 2013), yet not so many articles account for gender differences when assessing the impact of EE on individuals. This inquiry has been accounted for in all the other chapters of the dissertation (Chapters 2, 3, 4).

Second, another key point that emerged from Chapter 1 is the requirement for further empirical studies that compare different teaching models and contents of EE in order to explain the causes of contradictory findings in EE impact studies (as also suggested by Nabi et al., 2017). Specifically, in Chapter 2 the impact of the different teaching models was taken into account by referring to the framework introduced by Béchard & Grégoire (2005) and also considered by Nabi et al. (2017); on the other hand, in Chapter 3 the impact of different contents (i.e., different approaches to decision-making) taught within EE interventions was taken into account by referring to scientific approach to decision-making (Camuffo et al., 2020) and effectuation approach to decision-making (Sarasvathy, 2001).

Third, the SLR underlines the need for studies on the transition from entrepreneurial intentions into actual entrepreneurial behaviors (Fayolle & Liñán, 2014) through longitudinal analyses, and particularly how EE acts as a contingency of the gender-entrepreneurial behaviors relationship; specifically, Chapter 3 accounts for this gap in the literature.

Fourth, considering the type of EE outcomes, there is a call for further research assessing the impact of EE on non-task-related outcomes. Empirical studies in the field of EE often fail to recognize the significance of outcomes unrelated to specific venture tasks. These outcomes are essential for success in various aspects of life, not just within the entrepreneurial domain. One such crucial aspect, goal orientation, has been largely overlooked in EE literature despite its relevance, as noted by Payne et al. (2007). Specifically, Chapter 3 aims to detect the impact of different EE interventions on GO, which is not confined solely to the entrepreneurship domain, but it exerts a significant

influence on motivation in various other spheres of life (Dweck, 1986; Dweck et al., 1988; Elliot et al., 2017).

Fifth, studies based on experimental and quasi-experimental design are required. Considering another recent SLR, it calls for new studies that use strong designs such as experiments or quasi-experiments (Longva & Foss, 2018). Specifically, in this dissertation, a randomized control trial experiment has been implemented to assess the impact of EE (i.e., Chapter 4).

Last, another important aspect is considering the type of audience that followed EE interventions (Fayolle, 2013). Literature on EE impact studies mainly focused on students involved in higher education (i.e., university level) (Nabi et al., 2017), neglecting those EE attendees who are not students, such as enterprising individuals. Therefore, studies on a sample of non-student EE attendees are required; the last article of this dissertation (i.e., Chapter 4) investigates the impact of EE on a sample of enterprising individuals no longer students trained by the University.

6.1. SUMMARY OF FINDINGS

The research undertaken within this dissertation reveals significant gender differences in EE outcomes; it is observed that women and men enrolled in entrepreneurship courses and interventions experienced variations in their learning outcomes, intentions, and subsequent behaviors as well as motivational orientations. These differences are aligned with prior studies, but this research offers new insights into why these differences exist.

The empirical articles conceptualize and empirically test different mechanisms and contingencies that help to explain why gender differences persist in the entrepreneurial field and how EE, with its contents and teaching models, could help narrow this gender gap; indeed, by understanding the reasons behind these differences, we may create inclusive and efficient EE programs.

One crucial determinant identified is the teaching model used in EE courses. The first empirical article (Chapter 2) investigates how different teaching models implemented in EE courses highlight different impacts on entrepreneurial LO: while certain models demonstrated positive effects on entrepreneurial knowledge, skills, and abilities, others had limited influence. Importantly, gender-specific effects were observed, suggesting that certain teaching methods are more effective for one gender over the other.

These findings highlight the need for tailored approaches in EE, particularly when aiming to bridge the gender gap. Educators should consider not only the content of their courses but also the delivery methods (Fayolle, 2013), as they can significantly influence the acquisition of entrepreneurial competencies. In addition, another important aspect is having an enterprising family; given the important role that same-gender entrepreneurial role models play (e.g., within the family), education programs need to develop opportunities for students to have other important role models in the classroom that are inspiring for them.

The second reason is the transition from entrepreneurial intentions into actual entrepreneurial behaviors. Indeed, the actualization of entrepreneurial intentions into entrepreneurial behaviors varies by gender. Women exhibited a lower propensity to pursue entrepreneurial endeavors, and the research delved into the cognitive processes contributing to this phenomenon. The findings show that women are less likely to engage in entrepreneurial activities than men, not because they lack confidence or legitimacy but rather because their desire to do so is less intense and they have lower attitudes toward entrepreneurial behavior. In this sense, EE can be a catalyst for changing these dynamics by encouraging women to pursue entrepreneurial careers.

The final component of this research explores non-task-related outcomes stemming from EE; these outcomes, such as GO, are influenced by different types of interventions within EE and, again, gender-specific differences in how men and women respond to these interventions, shed light on the nuanced impact of EE.

6.2. THEORETICAL AND PRACTICAL CONTRIBUTIONS

Taken together, the studies of this dissertation help answer to the research questions: "How does Entrepreneurship Education, and particularly its contents and the teaching models, affect individuals' cognitive processes and learning outcomes? How do individual socio-demographic characteristics, and particularly gender, intertwin with such dynamics?".

Particularly, the dissertation develops empirical research with quantitative and experimental analyses, aimed at understanding cognitive processes and learning outcomes, enabling a deeper and more nuanced understanding of the dynamics within EE courses and in general within the Entrepreneurial University. It builds on established

theories in entrepreneurship research, such as “Human Capital Theory” in entrepreneurship research (Marvel et al., 2016), “Theory of Planned Behavior” (Ajzen, 1991), and “Achievement Goal Theory” (Dweck 1986).

The findings encourage that well-designed EE interventions can have a positive influence on final outcomes (e.g., task-related, and non-task-related outcomes) for both genders since EE could be a mechanism to increase the representativeness of women in the entrepreneurial field. The dissertation emphasizes the importance of adapting and tailoring teaching models in EE to meet the various needs of individuals. It highlights that the teaching model and the contents chosen should take into account individuals’ socio-demographic characteristics, goals, and levels of involvement in entrepreneurship.

By doing so, the research contributes substantially to the field of EE and the pursuit of gender equality in entrepreneurship (Piva & Rovelli, 2022; Shinnar et al., 2018). It highlights the importance of recognizing and addressing gender disparities in learning outcomes, intentions, behaviors, and motivational aspects within the EE context. First, the findings extend the debate on EE outcomes and particularly how teaching models and contents impact final outcomes differently (Fayolle, 2013; Nabi et al., 2017). Advancing knowledge on these topics can explain and explore the reasons for conflicting findings in EE impact studies (Bae et al., 2014; Martin et al., 2013; Nabi et al., 2017; Rideout & Gray, 2013). Afterward, exploring other contextual reasons such as whether the impact of EE on outcomes is gender-specific (Nabi et al., 2017) not only helps to explain contradictory findings but also contributes to the entrepreneurial field in general since (also) women entrepreneurship represents a relevant phenomenon in terms of impact on individuals and societies (Haus et al., 2013; Pergelova et al., 2023).

Then, the dissertation initially introduces the role of inspiration through role modeling (e.g., having an enterprising family). EE programs could focus on motivating students to build an entrepreneurial mindset and encourage more women to engage in entrepreneurship. This entails creating inclusive marketing strategies and curricula that encourage entrepreneurship in a way that is appealing to women, ultimately leading to a more positive mindset and higher entrepreneurial activity.

In practice, this implies that EE course designers and instructors must thoroughly examine the demands, needs, and characteristics of their audience before adapting their teaching approaches. This guarantees that EE courses are more successful in delivering

relevant knowledge, skills, and abilities, particularly for women, who may have different learning preferences and requirements. In addition, the dissertation goes beyond traditional measures of EE effectiveness by highlighting its impact on non-task-related outcomes, including motivation and achievement in various life domains. This suggests that EE programs have the potential to deliver broader benefits to individuals, extending beyond entrepreneurship. Therefore, practitioners should recognize and leverage these additional outcomes in program design and marketing to attract a wider audience and demonstrate the holistic value of EE.

Finally, the dissertation's practical contributions provide recommendations to EE practitioners, course designers, and program creators on how to improve the success of their endeavors. EE can become a more inclusive and impactful tool for individuals, particularly women, looking to underpin entrepreneurial careers as well as develop versatile competencies applicable to various aspects of life and career domains by tailoring teaching methods and contents, inspiring toward entrepreneurship, considering goal orientation, and acknowledging non-entrepreneurial outcomes.

6.3. LIMITATIONS AND FUTURE RESEARCH

This dissertation has some limitations that offer opportunities for future research to build upon and enhance the understanding of the complex relationships between EE, gender, cognitive processes, and learning outcomes. Limitations of each article have already been discussed in the precedent chapters and in Table 42, Table 43, Table 44, and Table 45; here will be highlighted the limitations that affect the dissertation as a whole.

First, the research questions of the three articles did not explore the impact on all the EE outcomes highlighted in Chapter 1: only a few outcomes have been considered in this dissertation trying to cover all the dimensions of the Human Capital Theory (i.e., knowledge, skills, and abilities, and their task-relatedness to venture tasks) (Marvel et al., 2016) and trying to answer to the most urgent literature gaps. This leaves gaps that can be addressed in future research.

Second, the studies in this dissertation focus on a range of cognitive characteristics and learning outcomes assessed using individuals' perceptions gathered from secondary survey data. The use of other data collection procedures, such as primary data, would allow investigating the EE effect on a much broader range of cognitive processes and

biases, learning outcomes assessed through objective measurements as well as gender stereotypes. Accordingly, the main limitation of the dissertation is the use of a binary gender variable that may oversimplify the gender dimension. Future studies could develop more precise measures considering gender stereotypes and social constructions.

Third, this dissertation is based on quantitative analyses; future studies should use qualitative and mixed methods, as well as longitudinal qualitative studies, to investigate the influence of EE over time in order to acquire a more comprehensive understanding of the types of learning outcomes and cognitive processes that individuals can attain or develop as a result of EE interventions.

A fourth limitation is that the articles assess the impact of EE cross-sectional data (Chapter 2) or data collected over a limited time frame (two years for Chapter 3 and five months for Chapter 4). Nevertheless, the effects of EE courses and interventions on outcomes may change over time in response to other external contexts or factors suggesting long-term follow-up studies that could address this limitation.

7. CONCLUSIONS

The dissertation has studied the EE effects with a particular emphasis on identifying the factors that explain how EE, specifically the teaching models and contents employed in entrepreneurship courses and interventions, influence the cognitive processes and learning outcomes of both men and women.

By exploring various target groups, including students, as well as enterprising individuals no longer university students, trained by the University, the articles within this dissertation conceptualized and empirically tested diverse mechanisms and contingencies that help to explain why gender differences persist in the entrepreneurial field and how EE, as an important mission of the Entrepreneurial University, could help to narrow this gender gap.

These results contributed to literature streams on EE impact research and women entrepreneurship field. Moreover, the research findings presented in this dissertation hold significant practical implications for educators, course designers, policymakers, and practitioners in the field of entrepreneurship.

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APPENDIX

Appendix Table 1. Outcome: Task-related Knowledge.

Outcome	N	References
Entrepreneurial Knowledge	15	Alakaleek et al., 2023; Bell, 2020; Bergman et al., 2011; Blimpo & Pugatch, 2021; Cornwall et al., 2015; Debarliev et al., 2022; Ferreras-Garcia et al., 2022; Heinonen et al., 2011; Huber et al., 2014; Johansen, 2017; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Packham et al., 2010; Volery et al., 2013
Learning Outcomes	4	Hahn et al., 2017; Ismail et al., 2018; Kleine et al., 2019; Rae & Woodier-Harris, 2012
Entrepreneurial Self-Insight	3	Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Perceive Barriers to Entrepreneurial Career	3	Bell, 2020; Kirkwood et al., 2014; Stamboulis & Barlas, 2014
Business Modelling and Planning	2	Johansen & Foss, 2013; Matlay, 2008
Action Knowledge	1	Gielnik et al., 2015
Business Risk	1	Matlay, 2008
Corporate Planning and Management	1	Oehler et al., 2015
Financial Mental Models	1	Bischoff et al., 2020
IP Management	1	Cheng et al., 2009
Marketing Knowledge	1	Matlay, 2008
Marketing Research Knowledge	1	Matlay, 2008
Negotiation Competencies	1	Cheng et al., 2009
Perceived Personal Benefits	1	Volery et al., 2013
Social and Economic Performance	1	Chang et al., 2014

Appendix Table 2. Outcome: Non-task-related Knowledge.

Outcome	N	References
Finance Knowledge	2	Matlay, 2008; Oehler et al., 2015
Organization and Management of Resources	2	Matlay, 2008; Oehler et al., 2015
School Subject Knowledge	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Self-Insight	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Accounting and Auditing Knowledge	1	Oehler et al., 2015
Basic Law Issues Knowledge	1	Oehler et al., 2015
Business Strategy	1	Matlay, 2008
Economic Aspects Knowledge	1	Oehler et al., 2015
Fiscal Aspects Knowledge	1	Oehler et al., 2015
Management Accounting	1	Oehler et al., 2015
Marketing Knowledge	1	Oehler et al., 2015
Mental Models	1	Lackéus, 2014

Appendix Table 3. Outcome: Task-related Skills.

Outcome	N	References
Entrepreneurial Self-Efficacy	29	Abaho et al., 2015; Bergman et al., 2011; Bohlayer & Gielnik, 2023; Boukamcha, 2015; Cadenas et al., 2020; Ciptono et al., 2023; Farashah, 2013; Florin et al., 2007; Gielnik et al., 2015, 2017; Hahn et al., 2020; Izquierdo & Buelens, 2011; Karlsson & Moberg, 2013; Kassean et al., 2015; Lackéus, 2020; Lackéus & Sävetun, 2019; Lima et al., 2015; Memon et al., 2019; Mukesh et al., 2020; Muñoz et al., 2020; Nowiński et al., 2019; Saeed et al., 2015; Sánchez, 2011, 2013; Shinnar et al., 2014; Vanevenhoven & Liguori, 2013; Volery et al., 2013; von Graevenitz et al., 2010; Wilson et al., 2007
Opportunity Skills	16	Bandera et al., 2018; Bell, 2020; Costa et al., 2018; García-Rodríguez et al., 2018; Gielnik et al., 2015, 2016; Heinonen et al., 2011; Johansen & Foss, 2013; Karimi, Biemans, Lans, Chizari, et al., 2016; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Morris et al., 2013; Muñoz et al., 2011, 2020; Volery et al., 2013
Learning Outcomes	14	Bell, 2020; S. C. Chen et al., 2015; Ferreras-Garcia et al., 2022; Hahn et al., 2017; Harms, 2015; Hytti et al., 2010; Ismail et al., 2018; Kleine et al., 2019; Lourenço et al., 2013; Lourenço & Jayawarna, 2011; Lyons & Zhang, 2018; Nabi et al., 2018; Rae & Woodier-Harris, 2012; Støren, 2014
Entrepreneurial Skills	13	Alakaleek et al., 2023; Cadenas et al., 2020; J. Chang & Rieple, 2013; Cornwall et al., 2015; Díaz-Casero et al., 2012; Ferreras-Garcia et al., 2022; Gilbert, 2012; Izquierdo & Buelens, 2011; Morris et al., 2013; Nguyen & Nguyen, 2023; Passaro et al., 2018; Rae & Woodier-Harris, 2012; Thomas, 2023
Business Modelling and Planning	8	Alaref et al., 2020; Armstrong, 2014; Cheng et al., 2009; Kolade, 2018; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Premand et al., 2016
Entrepreneurial Feasibility	6	Armstrong, 2014; Boukamcha, 2015; García-Rodríguez et al., 2018; Pergelova et al., 2023; Volery et al., 2013; von Graevenitz et al., 2010
Creativity	4	Debarliev et al., 2022; Huber et al., 2014; Lourenço & Jayawarna, 2011; Shahab et al., 2019
Financial and Accounting Competencies	4	Alaref et al., 2020; Blimpo & Pugatch, 2021; Debarliev et al., 2022; Premand et al., 2016
Business Idea Generation and Development	3	Cheng et al., 2009; Karimi, Biemans, Lans, Aazami, et al., 2016; Matlay, 2008
Communication and Presentation Skills	3	Cheng et al., 2009; Muñoz et al., 2020; Ulvenblad et al., 2013
Strategic Skills	3	Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Business Skills	2	Bell, 2020; Johansen, 2017
Feasibility of the Idea	2	Heinonen et al., 2011; Kirkwood et al., 2014
Business Project Management	1	Muñoz et al., 2020
Divergent Thinking	1	Karimi, Biemans, Lans, Aazami, et al., 2016
Guerrilla Skills	1	Morris et al., 2013
Management Competencies	1	Ferreras-Garcia et al., 2022
Market Research Competencies	1	Chang et al., 2014
Planning and Plan-making	1	Debarliev et al., 2022
Social Entrepreneurial Self-Efficacy	1	Hockerts, 2018
Wealth Generation	1	Dutta et al., 2011

Appendix Table 4. Outcome: Non-task-related Skills.

Outcome	N	References
General Self-Efficacy	10	Bandera et al., 2018; Gilbert, 2012; Hoang et al., 2021; Huber et al., 2014; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Morris et al., 2013; Oosterbeek et al., 2010a; Vanevenhoven & Liguori, 2013
Organization and Management of Resources	6	Chang & Rieple, 2013; Chang et al., 2014; Cheng et al., 2009; Debarliev et al., 2022; Ferreras-Garcia et al., 2022; Morris et al., 2013
Creativity	5	García-Rodríguez et al., 2018; Heinonen et al., 2011; Hytti & Heinonen, 2013; Oosterbeek et al., 2010a; Wang et al., 2022
Learning Outcomes	3	Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Marketing Skills	3	Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Business Skills	2	Alaref et al., 2020; Premand et al., 2016
Personal Organization	2	Alaref et al., 2020; Premand et al., 2016
Project Management	2	Alaref et al., 2020; Premand et al., 2016
School Subject Skills	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Study Skill	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Action Plan	1	Gielnik et al., 2015
General Skills	1	Kirkwood et al., 2014
Risk, Ambiguity, and Uncertainty Management	1	Morris et al., 2013
Technical Skills	1	Chang & Rieple, 2013

Appendix Table 5. Outcome: Task-related Abilities.

Outcome	N	References
Entrepreneurial Intentions	90	Adelaja, 2021; Ahmed et al., 2017; Alakaleek et al., 2023; Armstrong, 2014; Ayed, 2020; Bandera et al., 2018; Bhatti et al., 2021; Boukamcha, 2015; Chang et al., 2022; S. C. Chen et al., 2015; Ciptono et al., 2023; Cornwall et al., 2015; Debarliev et al., 2022; Dou et al., 2019; Duong, 2022; Entrialgo & Iglesias, 2016, 2017; Farashah, 2013; Fayolle & Gailly, 2015; Feder & Niţu-Antonie, 2017; Fernández-Pérez et al., 2019; Fretschner & Lampe, 2019; Fretschner & Weber, 2013; Galvão et al., 2018; García-Rodríguez et al., 2018; Gielnik et al., 2015; González-López et al., 2019; Haddoud et al., 2022; Hassan et al., 2020, 2021, 2022; Hoang et al., 2021; Hockerts, 2018; Huber et al., 2014; Ismail et al., 2018; Izquierdo & Buelens, 2011; Johansen & Foss, 2013; Johansen, 2017; Jones et al., 2017; Karimi, Biemans, Lans, Chizari, et al., 2016; Kassean et al., 2015; Laspita et al., 2023; Lima et al., 2015; Longva et al., 2020; Maresch et al., 2016; Marques et al., 2012; Martins et al., 2022; Mueller, 2011; Mukesh et al., 2020; Muñoz et al., 2020; Nabi et al., 2018; Ng et al., 2021; Nguyen & Nguyen, 2023; Nowiński et al., 2019; Oosterbeek et al., 2010a; Otache, 2019a; Otache et al., 2020, 2021; Passaro et al., 2018; Pergelova et al., 2023; Piperopoulos & Dimov, 2015; Porfírio et al., 2023; Rae & Woodier-Harris, 2012; Ramadani et al., 2022; Rauch & Hulsink, 2015; Rippa et al., 2020; Saeed et al., 2015; Sánchez, 2011, 2013; Schultz, 2022; Seyoum et al., 2021; Shahab et al., 2019; Shahin et al., 2021; Sherkat & Chenari, 2022; Shinnar et al., 2014, 2018; Solesvik, 2013; Souitaris et al., 2007; Støren, 2014; Thomas, 2023; Thoudam et al., 2023; van Ewijk & Belghiti-Mahut, 2019; Vanevenhoven & Liguori, 2013; Varamäki et al., 2015; Volery et al., 2013; von Graevenitz et al., 2010; Walter & Dohse, 2012; Zampetakis et al., 2015; Zaryab & Saeed, 2018; Zhang et al., 2014
Entrepreneurial Attitude	35	Ahmed et al., 2017; Debarliev et al., 2022; Dou et al., 2019; Duong, 2022; Entrialgo & Iglesias, 2016, 2017; Fayolle & Gailly, 2015; Feder & Niţu-Antonie, 2017; Galvão et al., 2018; García-Rodríguez et al., 2018; González-López et al., 2019; Izquierdo & Buelens, 2011; Jones et al., 2011; Karimi, Biemans, Lans, Chizari, et al., 2016; Karlsson & Moberg, 2013; Lackéus, 2020; Martins et al., 2022; Mueller, 2011; Ng et al., 2021; Otache et al., 2021; Packham et al., 2010; Padilla-Angulo et al., 2022; Passaro et al., 2018; Patzelt et al., 2014; Rauch & Hulsink, 2015; Shahab et al., 2019; Shahin et al., 2021; Solesvik, 2013; Souitaris et al., 2007; Stamboulis & Barlas, 2014; Varamäki et al., 2015; von Graevenitz et al., 2010; Walter & Dohse, 2012; Zampetakis et al., 2015; Zaryab & Saeed, 2018
Perceived Behavioral Control	21	Ahmed et al., 2017; Debarliev et al., 2022; Duong, 2022; Entrialgo & Iglesias, 2016, 2017; Fayolle & Gailly, 2015; Feder & Niţu-Antonie, 2017; Galvão et al., 2018; González-López et al., 2019; Karimi, Biemans, Lans, Chizari, et al., 2016; Martins et al., 2022; Mueller, 2011; Ng et al., 2021; Otache et al., 2021; Passaro et al., 2018; Rauch & Hulsink, 2015; Solesvik, 2013; Souitaris et al., 2007; Varamäki et al., 2015; Walter & Dohse, 2012; Zampetakis et al., 2015
Entrepreneurial Motivation	8	Ayed, 2020; Díaz-Casero et al., 2012; Farhangmehr et al., 2016; Hassan et al., 2021, 2022; Jones et al., 2011; Rodríguez-López & Souto, 2019; Solesvik, 2013
Entrepreneurial Identity	7	Åstebro & Hoos, 2021; Donnellon et al., 2014; Hytti & Heinonen, 2013; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Vanevenhoven & Liguori, 2013
Entrepreneurial Desirability	6	Armstrong, 2014; Boukamcha, 2015; Farashah, 2013; García-Rodríguez et al., 2018; Pergelova et al., 2023; Volery et al., 2013
Learning Outcomes	6	Bell, 2020; Hahn et al., 2017; Harms, 2015; Ismail et al., 2018; Kleine et al., 2019; Rae & Woodier-Harris, 2012
Risk Taking Propensity	6	Alaref et al., 2020; Premand et al., 2016; Sánchez, 2011, 2013; Volery et al., 2013; von Graevenitz et al., 2010
Innovativeness	5	Ayed, 2020; Bhatti et al., 2021; Florin et al., 2007; Mentoor & Friedrich, 2007; Volery et al., 2013
Entrepreneurial Passion	4	Gielnik et al., 2017; Haddoud et al., 2022; Lackéus, 2020; Lackéus & Sävetun, 2019
Entrepreneurial Self-Confidence and Self-Esteem	4	Kirkwood et al., 2014; Mentoor & Friedrich, 2007; Stamboulis & Barlas, 2014; von Graevenitz et al., 2010
Decision Making	3	Cheng et al., 2009; Ferreras-Garcia et al., 2022; Ilonen et al., 2018
Entrepreneurial Awareness	3	Bell, 2020; Kolade, 2018; Oosterbeek et al., 2010
Entrepreneurial Inspiration	3	Haddoud et al., 2022; Nabi et al., 2018; Wang et al., 2022
Entrepreneurial Mindset	3	Debarliev et al., 2022; Saadat et al., 2022; Secundo et al., 2020
Entrepreneurial Alertness	2	Saadat et al., 2022; Thomas, 2023
Entrepreneurial Orientation	2	Hassan et al., 2021; Martins et al., 2022
Need for Achievement and Achievement Motivation	2	Bhatti et al., 2021; Mentoor & Friedrich, 2007

Networking Competencies	2	Lyons & Zhang, 2018; Thomas, 2023
Social Orientation	2	Huber et al., 2014; Oosterbeek et al., 2010
Entrepreneurial Aspiration	1	Blimpo & Pugatch, 2021
Entrepreneurial Commitment	1	Sherkat & Chenari, 2022
Intrapreneurial Intentions	1	Longva et al., 2020
Managing Ambiguity	1	Debarliev et al., 2022
Motivation to Study Entrepreneurship	1	Hytti et al., 2010
Personal Control	1	Mentoor & Friedrich, 2007

Appendix Table 6. Outcome: Non-task-related Abilities.

Outcome	N	References
Interpersonal Abilities and Leadership	8	Cheng et al., 2009; García-Rodríguez et al., 2018; Gilbert, 2012; Huber et al., 2014; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Morris et al., 2013
Need for Achievement and Achievement Motivation	7	Alaref et al., 2020; Florin et al., 2007; Huber et al., 2014; Lackéus, 2014; Oosterbeek et al., 2010; Premand et al., 2016; Volery et al., 2013
Proactiveness and Sense of Initiative	7	Florin et al., 2007; Huber et al., 2014; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Sánchez, 2011, 2013
Tenacity and Perseverance	7	Alaref et al., 2020; García-Rodríguez et al., 2018; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019; Morris et al., 2013; Premand et al., 2016
Problem-Solving	6	Bandera et al., 2018; Cheng et al., 2009; Huber et al., 2014; Kirkwood et al., 2014; Morris et al., 2013; Muñoz et al., 2020
Resilience, Persistence, and Endurance	6	Bandera et al., 2018; Ciptono et al., 2023; González-López et al., 2019; Huber et al., 2014; Morris et al., 2013; Oosterbeek et al., 2010
Ambiguity and Uncertainty Tolerance	5	Bhatti et al., 2021; Haddoud et al., 2022; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Networking Competencies	5	Alaref et al., 2020; Cheng et al., 2009; Kirkwood et al., 2014; Morris et al., 2013; Premand et al., 2016
Innovativeness	4	Cadenas et al., 2020; Lackéus, 2014, 2020; Lackéus & Sävetun, 2019
Optimism	4	Alaref et al., 2020; Cadenas et al., 2020; Haddoud et al., 2022; Premand et al., 2016
Teamworking and Collaboration Abilities	4	Chang et al., 2014; Ferreras-Garcia et al., 2022; Lackéus, 2020; Lackéus & Sävetun, 2019
Adaptation and Flexibility	3	Morris et al., 2013; Oosterbeek et al., 2010; Ulvenblad et al., 2013
Locus of Control	3	Alaref et al., 2020; Blimpo & Pugatch, 2021; Premand et al., 2016
Need for Power and Power Motivation	3	Alaref et al., 2020; Oosterbeek et al., 2010; Premand et al., 2016
Openness	3	Alaref et al., 2020; Premand et al., 2016; Ulvenblad et al., 2013
Paid-employment Intentions or Being an Employee	3	Johansen, 2017; Jones et al., 2017; Otache et al., 2020
Risk Taking Propensity	3	Bandera et al., 2018; Huber et al., 2014; Oosterbeek et al., 2010
Agreeableness	2	Alaref et al., 2020; Premand et al., 2016
Conscientiousness	2	Alaref et al., 2020; Premand et al., 2016
Decision Making	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Emotional Stability	2	Alaref et al., 2020; Premand et al., 2016
Extraversion	2	Alaref et al., 2020; Premand et al., 2016
General Passion	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Impulsiveness	2	Alaref et al., 2020; Premand et al., 2016
Learning Exploitation Intention	2	Lourenço et al., 2013; Lourenço & Jayawarna, 2011
Moral Obligation and Civic Participation	2	Cadenas et al., 2020; Hockerts, 2018
Need for Autonomy and Need for Independence	2	Oosterbeek et al., 2010; Volery et al., 2013
Passion for Work	2	Alaref et al., 2020; Premand et al., 2016
Patience	2	Alaref et al., 2020; Premand et al., 2016
Polychronicity	2	Alaref et al., 2020; Premand et al., 2016
Self-Confidence	2	Bhatti et al., 2021; Gilbert, 2012
Self-Esteem	2	Lackéus, 2020; Lackéus & Sävetun, 2019
Critical Behavior	1	Cadenas et al., 2020
Empathy	1	Hockerts, 2018
General Aspiration (University and Professional)	1	Blimpo & Pugatch, 2021
General Attitude	1	Ferreras-Garcia et al., 2022
General Motivation	1	Lackéus, 2020
Grit	1	Blimpo & Pugatch, 2021
Individual Work	1	Ferreras-Garcia et al., 2022
Learning Desirability	1	Hoang et al., 2021
Non-conformity	1	Florin et al., 2007
Other Orientation	1	Ulvenblad et al., 2013
Personal Control	1	García-Rodríguez et al., 2018
Personal Maturity Abilities	1	Chang & Rieple, 2013
Responsibility	1	Lackéus, 2020
Training Retention	1	Bhatti et al., 2021

Appendix Table 7. Outcome: Task-related Others.

Outcome	N	References
Entrepreneurial Behaviors	28	Alakaleek et al., 2023; Alaref et al., 2020; Åstebro & Hoos, 2021; Bischoff et al., 2020; Blimpo & Pugatch, 2021; Breznitz & Zhang, 2022; Donnellon et al., 2014; Dutta et al., 2011; Eesley & Lee, 2021; Elert et al., 2015; Gielnik et al., 2015, 2016, 2017; Johansen, 2013; Karlsson & Moberg, 2013; Kolade, 2018; Lyons & Zhang, 2018; Matlay, 2008; Premand et al., 2016; Rauch & Hulsink, 2015; Ripollés & Blesa, 2023; Rippa et al., 2020; Schultz, 2022; Shinnar et al., 2018; Souitaris et al., 2007; Vincett & Farlow, 2008; Walter & Block, 2016; Zaryab & Saeed, 2018
Subjective Norms	21	Ahmed et al., 2017; Bandera et al., 2018; Díaz-Casero et al., 2012; Duong, 2022; Fayolle & Gailly, 2015; Feder & Nițu-Antonie, 2017; Galvão et al., 2018; González-López et al., 2019; Karimi, Biemans, Lans, Chizari, et al., 2016; Martins et al., 2022; Mueller, 2011; Otache et al., 2021; Passaro et al., 2018; Solesvik, 2013; Souitaris et al., 2007; Vanevenhoven & Liguori, 2013; Varamäki et al., 2015; von Graevenitz et al., 2010; Walter & Dohse, 2012; Zampetakis et al., 2015; Zaryab & Saeed, 2018
Entrepreneurial Performances	10	Chen & Agrawal, 2018; Eesley & Lee, 2021; Elert et al., 2015; Gordon et al., 2012; Harms, 2015; Huber et al., 2020; Kotey, 2007; Lyons & Zhang, 2018; Pazos et al., 2022; Vincett & Farlow, 2008
Team Behaviors and Processes	2	Hytti et al., 2010; Warhuus et al., 2021
Intrapreneurial Activity	1	Støren, 2014
Perceived Social Support	1	Hockerts, 2018

Appendix Table 8. Outcome: Non-task-related Others.

Outcome	N	References
Non-Entrepreneurial Performances	2	Blimpo & Pugatch, 2021; Rodríguez-López & Souto, 2019
Deep Learning	1	Lackéus, 2020
Future Events	1	Kirkwood et al., 2014

In the context of this dissertation, two additional and related articles have been developed with the support and collaboration of the research group I have worked with. These articles are not included in the main body of this dissertation, primarily because they have already been presented at conferences and published in journals. However, as they are the result of the overall effort of this dissertation and align with the same research stream as the dissertation, their abstracts and links are attached below.

Appendix Article 1.

Cascavilla, I., Hahn, D., & Minola, T. (2022). How You Teach Matters! An Exploratory Study on the Relationship between Teaching Models and Learning Outcomes in Entrepreneurship Education. Administrative Sciences, 12(1), 12. https://doi.org/10.3390/admsci12010012

ABSTRACT

Although entrepreneurship can be taught in different ways, entrepreneurship education impact studies generally fall short with regard to acknowledging the teaching models of the programs they assess. This severely limits our understanding of how entrepreneurship education actually works. To address this gap, this study describes and implements a procedure to identify the teaching models of entrepreneurship education courses and shows how different teaching models are associated with entrepreneurial learning outcomes. Our analysis is based on a sample of 376 Italian university students who responded to the Global University Entrepreneurial Spirit Students' Survey (GUESSS) and attended entrepreneurship education courses. We describe and implement a coding procedure that allows us to classify the entrepreneurship courses attended by the respondents into five different teaching models (Supply, Supply–Demand, Demand, Demand–Competence and Competence). We find that courses based on the Supply–Demand, Demand and Demand–Competence Models are associated with better entrepreneurial learning outcomes than those based on the Supply Model. Our findings contribute to the theory and practice of entrepreneurship education program evaluation and design.

Keywords: entrepreneurship education; entrepreneurial learning outcomes; global university entrepreneurial spirit students' survey (GUESSS); teaching models; university students

Appendix Article 2.

Hahn, D., Minola, T., Cascavilla, I., Ivaldi, S., & Salerno, M. (2021). Towards a theory-informed practice of entrepreneurship education for university students: the case of HC. LAB. Piccola Impresa/Small Business, (1).
https://doi.org/10.14596/pisb.2846

ABSTRACT

Amongst the various formal and informal mechanisms through which a university fosters student entrepreneurship, entrepreneurship education (EE) occupies a central role in the academic debate and in university practice. Despite the growing amount of EE studies in the last years, some puzzles persist. More specifically, much remains to be unveiled on how entrepreneurship should actually be taught in the classroom. Scholars lament a knowledge gap between the teaching practices of EE and the theoretical development of both the entrepreneurship and the general education fields. To contribute to this debate, this study de- scribes the characteristics and outcomes of the Healthcare Contamination Lab (HC.LAB), a six-month EE program. In particular, the authors describe a possible way to inform the design of EE with the theoretical foundations of entrepreneurship and with innovative education principles, using HC.LAB as a revelatory single case study. More specifically, for five dimensions of EE design, the authors outline the originality of the HC.LAB journey and offer some very preliminary evidence on the results of the first edition of HC.LAB.

Keywords: Entrepreneurship Education; Student Entrepreneurship; Contamination Lab.