Entrepreneurship Education and its Gendered Effects on Feasibility, Desirability and Intentions for Technology Entrepreneurship among STEM Students

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Abstract

Purpose - This study examines how entrepreneurship education influences intentions for starting a technology venture among science, technology, engineering, and mathematics (STEM) students with particular attention to gender differences. We build on the model of entrepreneurial event and social role theory to assess the impact of entrepreneurship education on feasibility, desirability, and intentions for technology entrepreneurship.

Design/methodology/approach - The hypotheses are tested with a sample of 879 Bulgarian science and engineering students from 15 universities. To test our models, we use ordinary least squares and logistic regressions with robust standard errors, as well as Hayes mediation analysis with bootstrap bias corrected confidence interval estimations for indirect effects. Two-stage Heckman regressions to control for sample selection bias and other robustness checks including propensity score matching were used.

Findings - Results show that entrepreneurship education, measured as participation in an entrepreneurship course, has a stronger impact on feasibility, desirability, and intentions for technology entrepreneurship for female STEM students compared to their male counterparts. As such, our study supports the notion that entrepreneurship education could be part of a solution to counteract societal norms that position technology entrepreneurship as a less desirable and / or less feasible choice for women in STEM. However, attention should be paid to the operationalization of entrepreneurship education, as other measures of entrepreneurship education (role models, entrepreneurship education support) did not have a moderation effect with gender.

Originality - Little is known about the role of entrepreneurship education in the field of technology entrepreneurship, and even less about the potential gender differences in entrepreneurship education among STEM students. The study contributes to the literature by examining factors that could help close the persistent gender gap in technology entrepreneurship.

Research limitations/implications - We assume a correlation between entrepreneurial intentions and entrepreneurial behavior. Future studies should include actual entrepreneurial behavior to paint a more complete picture of the effect of entrepreneurship education.

Keywords: Entrepreneurship education, STEM, feasibility, desirability, entrepreneurial intentions, technology entrepreneurship, gender

Introduction

Women entrepreneurship is receiving increasing attention both in research and policy; yet it is recognized that women-owned ventures tend to concentrate in crowded, low value-added sectors, such as retail and catering services (Marlow and McAdam, 2012; Wieland *et al.*, 2019). Conversely, women are under-represented in high-performing and innovation-driving entrepreneurial sectors related to the fields of Science, Technology, Engineering and Mathematics (STEM) which offer greater potential for enhanced social status and economic returns (Kuschel *et al.*, 2020; Poggesi *et al.*, 2020; Pugalia and Cetindamar, 2022). Despite public policy efforts to encourage girls to pursue STEM subjects the gender gap in STEM education affects the representation of women entrepreneurs in STEM fields, so that only 17% of start-up founders in Europe are women (European Parliament, 2021, c.f. Mari *et al.*, 2021). Indeed, technology entrepreneurship[1] has been characterized as a masculinized environment (Marlow and McAdam, 2015; Vershinina *et al.*, 2020) in which women perceive higher levels of structural impediments (Orser *et al.*, 2012). The token status of women in technology entrepreneurship is driven by the overlap of the masculine concepts of entrepreneurship and technology (Wheadon and Duval-Couetil, 2019), which puts women in STEM in 'double trouble' (van Veelen *et al.*, 2019).

One potential remedy to the low participation of women in technology venturing is entrepreneurship education. Research suggests that entrepreneurship education has a positive

[1]In this study technology entrepreneurship is defined as the creation of a new business whose products or services depend largely on the application of scientific or technological knowledge (Allen, 1992). Students in STEM fields exhibit the potential to start technology ventures (Souitaris et al., 2007) because of the scientific or technical knowledge they have gained during their education.

impact on students' human capital assets, intentions, interests, attitudes and aspirations for entrepreneurship (e.g., Bae *et al.*, 2014; Elliott *et al.*, 2021; Martin *et al.*, 2013). More specifically, entrepreneurship education in the STEM fields could help students overcome specific obstacles such as lack of entrepreneurial skills, aversion to financial issues, or lack of market focus (Paço *et al.*, 2017). From this perspective, entrepreneurship education could encourage women in STEM by providing skills, competencies, and role models that increase the perceived feasibility and desirability of an entrepreneurial career (Sanchez, 2011; Thursby *et al.*, 2009). However, some scholars have questioned the ability of entrepreneurship education to motivate female students given that entrepreneurship teaching cases, methods, and policies are largely embedded in a prevailing 'heroic male' normative assumptions and narratives, where entrepreneurship is equated with stereotypically male characteristics such as aggressiveness, boldness, and risk-taking, and women are positioned as deficient and in need of extra support (Ahl, 2007; Jones, 2014; Siivonen *et al.*, 2022; Sharen and McGowan, 2018). Therefore, it is important to address this tension and assess whether entrepreneurship education can have the potential to motivate female STEM students to pursue technology entrepreneurship. The scant extant literature about the role of entrepreneurship education in the field of technology entrepreneurship does not provide insights about gendered effects (Maresch *et al.*, 2016; Souitaris *et al.*, 2007), while the more general entrepreneurial intentions literature has yielded mixed and inconclusive results (e.g., van Ewijk and Belghiti-Mahut, 2019; Nowinski *et al.*, 2019; Shinnar *et al.*, 2014), which are not context-specific and do not provide guidance on how / whether entrepreneurship education for female STEM students can help reduce the persistent and troubling gender gap in technology entrepreneurship. Yet, this is an important setting to study

since the STEM fields are a key driver of innovation and growth, and women's participation in shaping the future via technology entrepreneurship deserves more attention.

Against this background, the research question that this study addresses is: *How does entrepreneurship education influence the feasibility, desirability, and intentions for technology entrepreneurship among female STEM students in comparison to their male counterparts?* We specifically focus on *feasibility* (individuals' perceptions about having the necessary skills to be an entrepreneur) and *desirability* (the degree of attractiveness of entrepreneurial career path) as key precursors to the intentions of female STEM students to start a technology venture, in order to provide evidence of the mediating mechanisms / pathways through which entrepreneurship education might help encourage the entrepreneurial intentions of women in technology venturing. Research suggests that gendered socialization which positions entrepreneurship as masculine territory can affect both of those key precursors, by lowering women's perceived self-confidence skills in this domain, and by rendering entrepreneurship as an undesirable career option (e.g., Maes *et al.*, 2014). What is not clear is whether entrepreneurship education could help overcome gendered socialization effects and motivate female students to see technology entrepreneurship as a desirable and feasible option for themselves. Our theorizing builds on social role theory and gendered socialization (Eagly *et al.*, 2000; Eagly, 2001; Wood and Eagly, 2010) in conjunction with Shapero and Sokol's (1982) model of entrepreneurial event to develop hypotheses about the differential effect of entrepreneurship education for female and male STEM students' perceptions of feasibility, desirability, and intentions for technology entrepreneurship. We test our theoretical model with a sample of 879 Bulgarian science and engineering students from 15 universities.

The study makes three primary contributions. *First*, our theoretical model and empirical results shed light on an under-researched phenomenon in dire need of evidence-based recommendations, namely, can entrepreneurship education help reduce the gender gap in technology venturing. While a few studies have looked at the role of entrepreneurship education for technology entrepreneurship generally (Maresch *et al.*, 2016; Souitaris *et al.*, 2007), there is a dearth of studies addressing the relationship between entrepreneurship education and the persistent gender gap in technology entrepreneurship (Armuña *et al.*, 2020; Elliott *et al.*, 2020). We examine two key theoretical mechanisms (feasibility and desirability) and show the important role of addressing those pre-venture stage aspects that are conditioned by gendered socialization, in order to open the way to more women in technology entrepreneurship. *Second*, we expand knowledge on the role of entrepreneurship education by adopting more fine-grained measures of the types of entrepreneurship education, and by conducting additional post-hoc analyses related to the entrepreneurship education *content*. Thus, we join recent calls for unpacking the types of entrepreneurship education activities that are most helpful for women (Padilla-Angulo *et al.*, 2022). *Third*, we contribute to a better understanding of the theoretical basis of intentions for technology entrepreneurship by zooming in on the intersection of sectorial (STEM) and gender assumptions (e.g., gendered career paths) underpinning the decision to engage in technology entrepreneurship, and the role of entrepreneurship education in this process. In doing so, we address recent calls to integrate intentionality models in specific contextual situations (Donaldson, 2019; Llados-Masllorens and Ruiz-Dotras, 2022). By focusing on the intersection of sector and gender, our theorizing enriches extant literature, specifically the personal choice-making within the broader cultural and social environment (Wilson *et al.*, 2007; Krueger et al., 2000). We, thus, bring attention to the importance of attending to the relationship

between individual agency and the social structure in which (potential) entrepreneurs are embedded, with an emphasis on the role of entrepreneurship education.

The paper is structured as follows. First, we present the theoretical background followed by the hypotheses of the study. Next, we elaborate on the method, including sample and measurement of variables. We then present the findings, and finally offer discussion and conclusions.

Theoretical background

To understand the potential differential effect of entrepreneurship education on intentions for technology entrepreneurship among female and male students, we turn to two theoretical perspectives: (1) Shapero and Sokol's (1982) model of entrepreneurial event which provides insights into feasibility and desirability as key precursors of technology entrepreneurship, and (2) Social role theory (Eagly *et al.*, 2000; Eagly, 2001; Wood and Eagly, 2010) which illuminates how gendered socialization processes can condition behavior and career choices. We introduce those theoretical perspectives briefly, then discuss the literature at the intersection of gender, entrepreneurship education, and entrepreneurial intentions and develop our hypotheses.

Intentions for Technology Entrepreneurship: The Role of Feasibility and Desirability

Intentions for technology entrepreneurship are a subset of entrepreneurial intentions (EI) which are "entrepreneurs' states of mind that direct attention, experience, and action toward a business concept" (Bird, 1988, p. 442). They are defined as the intent to start a business and/or to launch a new venture (Krueger, 1993). Intention indicates "how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991, p. 181). Shapero and Sokol's (1982) model of entrepreneurial event reveals "how the cultural and

social environment affects the choice of an entrepreneurial path" (Veciana *et al.*, 2005, p. 167). The model posits that entrepreneurial intentions have three attitudinal antecedents: perceived desirability, perceived feasibility and a propensity to act upon opportunities (Krueger *et al.*, 2000). Perceived desirability is defined as the perceived degree of attractiveness of an entrepreneurial career path. Perceived feasibility is the individuals' perceptions about having the necessary skills to be an entrepreneur. Propensity to act refers to a person's inclination to act on one's decision to start a business. Importantly, Shapero and Sokol's model postulates that exogenous factors such as prior exposure to entrepreneurship (e.g., through entrepreneurship education), influence intentions indirectly through affecting the perceptions of feasibility and desirability.

We chose to use Shapero and Sokol's model because the women entrepreneurship literature has long emphasized that gendered socialization reduces the perceived desirability of entrepreneurship as a career choice for women, as well as their perceived competency to be entrepreneurs (feasibility). Thus, the model is theoretically aligned with the women entrepreneurship literature and has the potential to reveal how entrepreneurship education can impact intentions for technology entrepreneurship. More particularly, we focus on the two constructs that have received strong empirical support as predictors of EI: desirability and feasibility (Schlaegel and Koenig, 2014).

While entrepreneurial intentions is a well-established field, very little insights have been provided for intentions to start a technology venture (Souitaris *et al.*, 2007), as most studies focus on entrepreneurial intentions in general and are not context-specific (Liñán and Fayolle, 2015). On the other hand, studies reviewing technology entrepreneurship research (Bailetti, 2012; Ferreira *et al.*, 2015) demonstrate that it is focused mainly on themes related to the creation,

functioning and development of technology firms and the institutional factors, governmental policies and support mechanisms that influence them. This literature contributes little to understanding the determinants of intentions to start a technology venture. However, for advancing knowledge on entrepreneurial behavior in technology entrepreneurship, it is important to investigate pre-venture characteristics and processes of potential technology entrepreneurs and to identify their antecedents. Specifically, we focus on feasibility and desirability as key mechanisms for understanding gendered aspects of intentions for technology entrepreneurship. In order to ground our arguments about the determinants of female STEM students' intentions to start a technology venture, we complement Shapero and Sokol's (1982) model of entrepreneurial event with social role theory.

Social Role Theory

At the basis of social role theory is the assumption that sex differences in social behaviors are the results of the distribution of men and women into different social roles (Eagly and Wood, 2016; Eagly et al., 2000). This distribution of roles has led to gender-specific traits and behaviors which for men typically include agentic aspects such as dominance and assertiveness, while for women the gender role typically emphasizes communal behaviors such as nurturing and friendliness (Anglin *et al.*, 2022). Gender roles not only emerge from the social roles typically occupied by women and men, but are also based on shared expectations about 'appropriate' behavior that is based on people's observed (socially identified) sex, i.e. people expect certain behaviors from individuals based on whether that individual is male or female (Eagly, 2001). Gender roles are pervasive in their influence on 'gender-appropriate' behavior because they are socially modeled and reinforced, and furthermore, both men and women internalize those roles

and tend to exhibit behaviors that conform to them (Anglin *et al.*, 2022, p. 1478). In the next section, we discuss how such gendered expectations can limit women's entrepreneurial intentions and how entrepreneurial education could counteract this limiting effect.

Gender Differences in Entrepreneurial Intentions and the Role of Entrepreneurship Education

Consistent with social role theory, and the 'masculinized' perception of the field of entrepreneurship, men generally are more likely to manifest entrepreneurial intentions than women (Haus *et al.*, 2013; Yordanova and Tarrazon, 2010; do Paço *et al.*, 2015). Among the factors that explain these differences are fear of failure, perceived lack of competence, and other perceived barriers, such as lack of social network support. From a social role theory standpoint, societal gender role attributions that lead to occupational gender typing is another barrier to women's engagement in entrepreneurship (Shinnar *et al.*, 2012). Because women and men are subjected to different socialization practices due to their observed sex, they assume socially differentiated roles and are confronted with different role expectations, which in turn may affect their career choices and preferences (Wieland *et al.*, 2019). Traditions and norms that determine gender roles are important for understanding when, how and why some women start their own businesses (Welter, 2011). Social norms across many societies tend to relate entrepreneurial activity to men and masculine entrepreneur attributes (Ahl, 2006; Bruni *et al.*, 2004; Gupta *et al.*, 2009). In many societies there are widely held beliefs that entrepreneurship is man's work, requiring qualities such as assertiveness and strength (Welter *et al.*, 2006; Gupta *et al.*, 2009).

Studies exploring education as an antecedent to EI have generally found a positive

relationship between entrepreneurship education and EI (e.g., Martin *et al.*, 2013; Nabi *et al.*, 2017; Souitaris *et al.*, 2007). The scant empirical studies examining the effect of entrepreneurship education on EI by gender, however, provide mixed results. For instance, Wilson *et al.* (2007) show that entrepreneurship education has a stronger impact on entrepreneurial self-efficacy among females than males. Similarly, Santos-Jaen *et al.* (2022) propose that gaining entrepreneurial competencies through education increases self-confidence for women. However, Bae *et al.* (2014) found no significant moderation effect of gender, and Zhang *et al.* (2014) found that if all students receive entrepreneurship education, males have a higher EI than females do. Packham *et al.* (2010) found that female students were more likely to perceive a greater benefit from the learning experience, but the impact of entrepreneurship education on entrepreneurial attitude was more pronounced for male students. With respect to gendered effects in technology entrepreneurship, the domain of interest to our study, little is known about whether entrepreneurship education has the potential to reduce the gender gap, as there is a dearth of studies situated in this context (Elliott *et al.*, 2020).

Hypotheses Development

Entrepreneurship Education and Feasibility

Feasibility, as defined earlier, refers to the degree to which a person feels capable of starting a business. Importantly, from a social role theory perspective, one way in which gender roles influence behavior, is that they affect people's self-concepts, or people's ideas about themselves and their abilities (Eagly, 2001). The link between gender roles and individuals' self-construals is posited to explain why there are significant differences in the extent to which women and men engage in behavior consistent with their gender roles based on their observed sex. Gendered

socialization is a major factor that has been examined as a determinant of a lower perceived efficacy for women in the domain of entrepreneurship and subsequent 'gendered' career paths (Wilson *et al.*, 2007; Wieland *et al.*, 2019). Specifically, for the STEM context, evidence suggests that girls are moving toward academic parity in subjects such as math and science, but are still shunning careers in these fields (Diekman *et al.*, 2010; Rosenbloom *et al.*, 2008), a major reason for which is believed to be socio-structural encumbrances which position both technology and entrepreneurship as masculine domains , thus limiting women's perceived feasibility in those fields (Bandura *et al.*, 2001; Wheadon and Duval-Couetil, 2019). Thus, women in technology entrepreneurship seem to be in a double-encumbrance, as societal gendered expectations may lower both their perceived feasibility (feeling capable of becoming an entrepreneur), as well as STEM-related perceptions of their skills and abilities.

One potential approach to increasing the feasibility of entrepreneurship as a career path for STEM students is entrepreneurship education. According to Krueger and Brazeal (1994) entrepreneurship education improves people's knowledge and self-confidence, therefore fostering perceived feasibility. Entrepreneurship education is also associated with other psychological outcomes including higher perceived self-efficacy (Chen *et al.*, 1998), identification of more opportunities (DeTienne and Chandler, 2004), increase in entrepreneurial competences (Sanchez, 2011) and improvement in entrepreneurial capabilities (Thursby *et al.*, 2009), which may lead to higher perceived feasibility. In the entrepreneurship literature, the concept of self-efficacy (Bandura, 1989) (individuals' self-perceptions of their skills and abilities) has been extensively studied (e.g., Wilson *et al.*, 2007), as it is believed that individuals will engage in entrepreneurship if they perceive that they have the abilities to do so, i.e. they perceive it as a feasible career path for themselves. Specifically, entrepreneurship education is

expected to lead to higher self-efficacy, which in turn may increase perceptions of feasibility and EI. Research suggests that self-efficacy is domain-specific and women have lower entrepreneurial self-efficacy in masculine-typed domains (Wieland *et al.*, 2019), which subsequently lowers their EI (Kickul *et al.*, 2008; Wilson *et al.*, 2007).

We expect that the impact of entrepreneurship education on feasibility will be stronger for women because they have been traditionally disadvantaged by gendered societal arrangements that position both entrepreneurship and STEM as male-appropriate career choices (Bae *et al.*, 2014). Research also suggests that although men have higher EI than women, entrepreneurship education may have an 'equalizer' effect on EI for women (Wilson *et al.*, 2007). This is because the wider structure of gendered socialization processes shapes individuals' assumptions concerning how females and males should behave, including entrepreneurial roles (e.g., Ahl, 2006; Kalnins and Williams, 2014). Societal gender role expectations are at the root of occupational segregation (Díaz-García *et al.*, 2016), which leads to internalization of norms and perceptions that entrepreneurship is a male territory. When certain occupations are typed as masculine, women's intentions to pursue these occupations are weaker, because they perceive themselves as less able and/or skilled (Thébaud, 2010). Thus, entrepreneurship education may be more helpful for women to strengthen their skills and increase their self-efficacy and EI. Conversely, because males are more likely to consider an entrepreneurial career due to societal gender role expectations, there is "lower neediness of entrepreneurial education for men" (Bae *et al.*, 2014, p. 223). Thus, entrepreneurship education is especially important as a means to increase feasibility among female STEM students. Recent qualitative research also suggests that entrepreneurship education can increase self-efficacy and entrepreneurial intentions among female engineering students (Elliott *et al.*, 2020). Therefore, we

expect:

H1a: Entrepreneurship education positively affects feasibility among STEM students.

H1b: The relationship between entrepreneurship education and feasibility among STEM students is stronger for females compared to males.

Entrepreneurship Education and Desirability

Desirability is defined as the perceived attractiveness of starting a business, i.e., the degree to which an individual finds entrepreneurship attractive (Shapero and Sokol, 1982). Social and cultural norms are relevant determinants of desirability perceptions. In Shapero and Sokol's (1982) model of EI, the social and cultural environment affects the decision to become an entrepreneur, and perceptions of the desirability and viability of such an event are vital. Similarly, social role theory postulates that gender roles induce role-consistent behaviors which derive from what is expected for men and women, and importantly what is considered desirable for them (Eagly, 2001). It is recognized that women and men are socialized differently (Elam and Terjesen, 2010); for instance, as a result of upbringing and social expectations, women tend to be more cautious and more risk-averse than men (Powell and Ansic, 1997; Thomas and Mueller, 2000). Social norms also lead women to consider family happiness as more important than career (Aculai *et al.*, 2006). As a result, the desirability of entrepreneurship as a career path tends to be lower for females compared to males (Díaz-García and Jiménez-Moreno, 2010), especially in fields that are perceived as less 'gender congruent' for women, such as STEM (Wieland *et al.*, 2019). Of particular importance here is the 'social desirability', or the perception of the individual about what the people closest to them might think about them engaging in entrepreneurship, and whether or not they would see it as desirable (Krueger, 1998; Sánchez-

Escobedo *et al.*, 2011).

Entrepreneurship education is also considered as a socialization process into entrepreneurship (Dyer, 1995). Falkäng and Alberti (2000) identified several positive effects for participants in entrepreneurship education related to the development of students and their own identities in light of their learning experiences including identification of individual potential and changed attitudes. Entrepreneurship education may provide various social experiences such as exposure to entrepreneurial role models, which may enhance the perceived desirability of starting a business (Peterman and Kennedy, 2003). Based on socialization and prevailing discourses, males are a priori more likely to find an entrepreneurial career desirable, since entrepreneurship's image fits with stereotypically male attributes. Conversely, females might find entrepreneurship less desirable based on societal gendered expectations. Thus, we expect that entrepreneurship education will be especially important for female STEM students to increase the extent to which they find entrepreneurship desirable. Entrepreneurship education can help these students to re-conceptualize entrepreneurship as a career choice that is equally available and desirable for both genders (Bae *et al.*, 2014). It should be noted that female STEM students have already challenged traditional gendered career assumptions by virtue of pursuing education, and hence, a career in STEM, a domain that does not conform to traditional gendered roles. Thus, we can surmise that entrepreneurship education may further drive them to increase their agency and consider a technology entrepreneurship path as desirable. Therefore, we expect:

H2a: Entrepreneurship education positively affects desirability among STEM students.

H2b: The relationship between entrepreneurship education and desirability among STEM students is stronger for females compared to males.

Entrepreneurship Education and Intentions for Technology Entrepreneurship

Following Shapero and Sokol's (1982) model, entrepreneurship education can affect EI via its effect on feasibility and desirability, i.e., feasibility and desirability serve as mediators. However, scholars have advocated that the knowledge and human capital that come with entrepreneurship education can also impact EI directly (e.g., Bae *et al.*, 2014; Zhang *et al.*, 2014). Indeed, a central objective of entrepreneurship education is to increase EI among students (Shinnar *et al.*, 2014). Through entrepreneurship education, science and engineering students may acquire entrepreneurship-related knowledge and skills, entrepreneurial competencies and capabilities, abilities for opportunity identification and abilities to plan and perform entrepreneurial activities, which may enhance EI. Empirical research demonstrates that entrepreneurship education is associated with entrepreneurship-related human capital (Martin *et al.*, 2013; Rideout and Gray, 2013). Specific knowledge about entrepreneurship gleaned from entrepreneurship education may enhance entrepreneurial skills (Støren, 2014) and opportunity-identification intentions and abilities (Solesvik *et al.*, 2014; Solesvik *et al.*, 2013; Souitaris *et al.*, 2007), while relevant information might allow for reducing risk and the barriers to new firm formation (Mukhtar *et al.*, 1999). Entrepreneurship-related human capital such as knowledge and skills may be especially valuable for entrepreneurs in technology sectors where technology challenges in the environment are often on the edge of scientific possibility and business survival and growth depends on implementing a reliable innovation strategy (Park, 2005).

We should note that the empirical results on the effect of entrepreneurship education on EI are not always conclusive. For instance, some authors have failed to find a significant relationship between entrepreneurship education and EI (e.g., Fayolle *et al.*, 2006; Wu and Wu, 2008). Conversely, in a study specifically focused on science and engineering students, Souitaris

et al. (2007) found that entrepreneurship programs are a source of trigger-events, which inspire students. Overall, the evidence is in favor of a positive relationship between entrepreneurship education and EI, as demonstrated in meta-analyses (e.g., Bae *et al.*, 2014; Martin *et al.*, 2013).

Following the arguments presented in H1 and H2 regarding gendered socialization and consequent gendered occupational choices, here again we expect that entrepreneurship education will be more important for women compared to men when forming intentions for technology entrepreneurship. Because male students are more likely to be inclined to consider an entrepreneurial career (which aligns with societal gendered expectations), it reduces their need of additional impetus from entrepreneurship education to form EI. Previous empirical research lends support to this thesis, suggesting that entrepreneurship education has a higher impact on the entrepreneurial self-efficacy of women than of men (Wilson *et al.*, 2007) which may eventually result in a higher impact on the entrepreneurial intentions of women than men. Overall, we expect that entrepreneurship education will have a direct positive effect on intentions for technology entrepreneurship. Following Shapero and Sokol (1982), we also expect that entrepreneurship education affects intentions for technology entrepreneurship through the pathways of desirability and feasibility. Furthermore, we propose that the relationship between entrepreneurship education and intentions for technology entrepreneurship will be stronger for women in STEM compared to their male counterparts. Formally:

H3a: Entrepreneurship education positively affects intentions for technology entrepreneurship among STEM students.

H3b: The relationship between entrepreneurship education and intentions for technology entrepreneurship will be mediated by feasibility and desirability.

H3c: The relationship between entrepreneurship education and intentions for technology

entrepreneurship among STEM students is stronger for females compared to males.

Figure 1 presents our conceptual model. Our focus is on testing a gender moderation on the relationship between entrepreneurship education and the three dependent variables: feasibility, desirability, and intentions for technology entrepreneurship. To maintain fidelity to the original Shapero and Sokol's (1982) model specification, we have also included the relationship between feasibility and intentions for technology entrepreneurship, as well as desirability and intentions for technology entrepreneurship. This allows us to verify whether feasibility and desirability act as mediators, as advanced in H3b.

[Insert Figure 1 here]

Method

Context

The context of this study is Bulgaria, a mid-income country in Eastern Europe which was under a communist regime for more than 40 years, and after undergoing a transition to a market economy, joined the European Union in 2007. The country presents an interesting context for studying women's intentions to become technology entrepreneurs. During the communist regime, there was a proclaimed emancipation of women (Manolova *et al.*, 2007). This institutional imprinting has led to a relatively high proportion of women students in STEM disciplines (Eurostat, 2020). However, the country suffers from a low percentage of women entrepreneurs in the STEM fields. As such, Bulgaria provides a fertile context to test the role of entrepreneurship education in affecting STEM students' intentions for technology entrepreneurship. Although various policy measures related to entrepreneurship have been

implemented since 2008, early-stage entrepreneurial activity in Bulgaria is relatively low while its economic impact is limited. Bulgaria performed well below the EU average in total early-stage entrepreneurial activity in the 2015 - 2018 period, the observation window of our study (European Commission, 2018a, 2019; PricewaterhouseCoopers, 2020). In 2018, the total early stage entrepreneurial activity reached 6%, which is the highest annual rate for the period 2015 - 2018, yet it still remained below the EU average (7.64% (European Commission, 2018a, 2019; PricewaterhouseCoopers, 2020). A very small part of early-stage entrepreneurial activity is innovative, i.e., its product or service is new to some or all customers and is offered by few or no other competitors (European Commission, 2019; PricewaterhouseCoopers, 2020). The opportunity-driven entrepreneurial activity is one of the lowest in the EU (European Commission, 2018a, 2019; PricewaterhouseCoopers, 2020).

Recently, there has been a positive tendency in the societal attitudes towards entrepreneurship (PricewaterhouseCoopers, 2020). In 2018, the percentage of Bulgarian adults regarding entrepreneurship as a good career choice (62.57%) and the percentage of Bulgarian adults agreeing that successful entrepreneurs enjoy high status in the country (69.31%) have increased since 2015 and are slightly above the EU average (59.81% and 69.17%, respectively) (European Commission, 2019; PricewaterhouseCoopers, 2020). However, the share of the adult population in Bulgaria perceiving good opportunities to start a business in the area where they live and the share of the adult population in Bulgaria with self-perceived capabilities for entrepreneurship have decreased during the 2015 – 2018 period (PricewaterhouseCoopers, 2020) which may imply a need for high quality entrepreneurship education and training.

In 2015, the Bulgarian government adopted an action plan Entrepreneurship 2020 – Bulgaria as part of the European Commission's Entrepreneurship 2020 Action Plan Reigniting

the entrepreneurial spirit in Europe (European Commission, 2013). One of the key areas for immediate intervention was entrepreneurial education and training to support growth and business development of new enterprises, which included measures for the introduction of entrepreneurship education in the Bulgarian primary and secondary educational system and in the Bulgarian higher education institutions. In 2017, entrepreneurship education was part of 193 disciplines in Bulgarian universities (Ministry of Economy, 2018). Bulgarian higher education institutions have introduced required and elective entrepreneurship courses within some but not all of their academic programs in the STEM fields and therefore not all STEM students have access to entrepreneurship education (PricewaterhouseCoopers, 2020). Currently, 13 accredited undergraduate and 26 postgraduate programs in entrepreneurship are offered by 18 Bulgarian universities (Yahiya *et al.*, 2022). Most of these programs are in the field of business and economics (18 programs), but there are also programs in the social, technology, digital, construction, and biology sectors (Yahiya *et al.*, 2022). In 2018, 16 Bulgarian universities reported they maintained centers for entrepreneurship (Ministry of Economy, 2019). As in other European Union member states, there are not enough professors in entrepreneurship in Bulgarian universities (European Commission, 2008) and thus entrepreneurship courses are often taught by professors in other fields.

Data and Sample

Data for this study were collected with an in-person (pen-and-paper) survey (n = 879) of intentions for technology entrepreneurship among Bulgarian STEM students. STEM students have been shown to exhibit the potential to start technology ventures (Souitaris *et al.*, 2007), and

as such were considered an appropriate group for our study. Mosey *et al*. (2017) suggest that the university is a suitable setting for researching technology entrepreneurship because researchers could examine individual characteristics and attitudes of potential technology entrepreneurs (e.g., STEM students) along with university-related activities to support entrepreneurship. The questionnaire for the survey was developed in English and translated into Bulgarian by a bilingual person. The Bulgarian version of the questionnaire was then back-translated into English and all discrepancies resolved.

Invitation letters for participation in the study were sent to university presidents or deans in all 24 Bulgarian universities providing STEM bachelor and master programs. After receiving consent from 15 universities, the survey was administered in-person to students in those universities in 2015 and 2016, following a quota sampling technique (based on the proportion of the number of STEM students enrolled in each university). Participants in the study are from various fields including communication and computer equipment, informatics and computer sciences, biotechnologies, electrical engineering, electronics and automation, power engineering, transport, navigation and aviation, general engineering, biological sciences, chemical sciences, chemical technologies, architecture, construction and geodesy, earth sciences, minerals prospecting, extraction and processing, mechanics, energetics, and food technologies. At the beginning of the survey, students were informed that their participation is voluntary, and the survey should be completed anonymously.

Measures

Since we examine the influence of entrepreneurship education on intentions for technology entrepreneurship through the mediation of feasibility and desirability (Krueger 1993; Shapero

and Sokol, 1982), we have three sets of variables: dependent variable, mediating variables, and independent variables. Table 1 provides details on the operationalization of variables.

Dependent variable

Intentions for technology entrepreneurship. Following Krueger (1993), we measure entrepreneurial intention as a binary answer to the survey question "Do you think you'll ever start a technology business?" (0: no, 1: yes). As a robustness check, we use an alternative measure of entrepreneurial intention focusing on starting a business venture in general (and not specific to a technology business). We provide more details in the robustness check section.

Mediating variables

Following Shapero and Sokol's (1982) model of the entrepreneurial event, we have two mediating variables: feasibility and desirability.

Feasibility. To measure feasibility, we use 5 items in a 7-point Likert scale. All feasibility items are framed in the context of starting a technology business. These five items include practicality, difficulty, workload, certainty of success and knowledge and are all in line with Drennan et al. (2005), Krueger (1993) and Krueger *et al.* (2000). We use principal component analysis with varimax rotation to build a composite measure of feasibility. The eigenvalue of the construct is 2.489 with an explained variance of .498 and a Kaiser-Meyer-Olkin (KMO) of .686. The Cronbach's alpha of feasibility is .744 which is within standards (Hair *et al.*, 2010).

Desirability. We operationalize desirability using 3 items in a 7-point Likert scale following Drennan *et al.* (2005), Krueger (1993) and Krueger *et al.* (2000). These three items

capture the attractiveness, feeling and enthusiasm about starting a technology business. Similar to the way we build feasibility, we also use principal components with varimax rotation to construct desirability. The eigenvalue of the desirability construct is 2.181 with an explained variance of .727, a KMO of .679 and a Cronbach's alpha of .806. All these scores are well within the norms (Hair *et al.*, 2010).

Independent variables

Entrepreneurship education. We use three variables to measure entrepreneurship education: entrepreneurship education course, perceived entrepreneurship education support and role models in entrepreneurship courses.

Entrepreneurship education course. We measure entrepreneurship education course focusing on whether the STEM students have taken an entrepreneurship course at the university (Souitaris *et al.*, 2007). Specifically, we build this variable by combining answers to two survey questions: whether the respondent has taken or is taking an entrepreneurship course within his/her program of studies and whether the participant has taken or is taking an entrepreneurship course outside of the current program but within the university. Approximately 70% of respondents indicated no to both questions, 24% chose yes to one of these questions, and 5% said yes to both questions. Because the percentage of yes to both questions is small, we proceeded as follows to operationalize entrepreneurship education course. If the respondent said yes to at least one of these questions, we assigned a score of 1; and if the respondent answered no to both questions, we assigned a 0.

Perceived entrepreneurship education support. To measure this variable, we use 10 items and follow Saeed *et al.* (2015). For each of these items we employ a 7-point Likert scale

from totally disagree to totally agree. In order to reduce these items to the underlying factor perceived entrepreneurship education support, we use principal component analysis with varimax rotation. Eigenvalue and variance explained for this variable are 7.156 and .716, respectively. KMO for this variable is .944 and Cronbach's alpha is .955, well within established norms (Hair *et al*., 2010).

Role models in entrepreneurship courses. We use 3 items following Walter *et al*. (2013). We use principal component analysis with varimax rotation to reduce these items to the underlying factor role models in entrepreneurship courses. The eigenvalue of the construct is 2.015 with an explained variance of .672 and a KMO of .549. The Cronbach's alpha for role models in entrepreneurship courses is .741 which is within standards (Hair *et al*., 2010).

Moderator variable

Gender. The moderating variable of this study is gender. We measured gender as the students' biological sex, where 1 is female and 0 is male[2] in line with the extant literature examining the effect of entrepreneurship education on intentions (e.g., Padilla-Angulo *et al*., 2022; van Ewijk and Belghiti-Mahut, 2019; Westhead and Solesvik, 2016).

Control variables

We used a number of control variables, typically employed in empirical research in entrepreneurship.

[2] While we acknowledge the important distinction between biological sex and socially constructed gender, our study data do not have an operationalization that could differentiate between the two concepts. There are theoretical and contextual reasons for our approach. From a social role theory perspective, social expectations on women and men are imposed based on their observed sex. From a contextual point of view, it is important to mention that there are no separate concepts (and hence words) for "sex" and "gender" in the Bulgarian language (Darakchi, 2019).

Age. Following Walter and Block (2016), we use respondent's age in years.

Professional experience. We specifically focus on professional experience in technology companies (Souitaris *et al*., 2007). This is a binary variable where 1 indicates that the respondent has professional experience in the industry.

Perceptions of the entrepreneurship environment. We use a 7-point survey question that asks about the perception of the environment in Bulgaria, where is 1 is extremely unfavorable and 7 extremely favorable (Walter and Block, 2016).

Social network support. We measure support from family and friends using a 7-point scale from 1 (no support) to 7 (full support) (Walter *et al*. 2013).

[Insert Table 1 here]

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) with robust standard errors was performed to verify if the multi-item variables fit the expected structure of Figure 1, how well the items represent the constructs, and if the theoretical measurement model is valid (Hair *et al*., 2010). Appendix 1 provides the results of the CFA including factor loadings, average variance extracted (AVE), construct reliability as well as means and standard deviations of all items. Results of CFA assessing the measurement model validity are detailed next.

Overall fit. The overall model $\chi 2$ is 1676.702, $p < 0.001$. The root-mean-squared error of approximation (RMSEA) is 0.099, the comparative fit index (CFI) is 0.876, and the Tucker Lewis index (TLI) is 0.858.

Convergent validity. As reported in Appendix 1, standardized factor loading estimates

of our measurement model for each construct are above the cutoff point of 0.50 with the exception of three items. The average variance extracted (AVE) estimates exceeded the 50% rule except for feasibility. Construct reliabilities exceed 0.7, suggesting adequate reliability. The evidence supports the convergent validity of the measurement model (Hair *et al.*, 2010). Therefore, all items are retained at this point and adequate evidence of convergent validity is provided.

Discriminant validity. All AVE estimates of constructs are greater than the corresponding interconstruct squared correlation estimates, as Appendix 2 shows, except for feasibility and desirability (which both are dependent variables). Discriminant validity test indicates there are no problems with the discriminant validity of the CFA model.

Common Method Bias

We follow the process proposed by Podsakoff *et al.* (2003) to make sure that common method bias is not a problem in our survey data. First, we separate the measurement of independent and dependent variables. In our questionnaire, we utilize different response scaling techniques such as Likert scales, multiple choice, very unimportant to very important scales, yes/no, totally agree to totally disagree, favorable/unfavorable, to less extent to very much extent, open-ended questions, and others. The order of independent and dependent variables did not follow a logical order so that we can minimize "the respondent's ability and/or motivation to use previous answers to fill in gaps in what is recalled and/or to infer missing details" (Podsakoff *et al.* 2003, p. 888). Second, all responses were anonymous to protect respondent anonymity and thus to reduce apprehension during evaluation. This procedure helps reduce the likelihood to make participants' responses more socially desirable, lenient, acquiescent, and consistent with

how respondents think we want them to respond (ibid, p. *888*). Third, we also check statistically if common method bias was a problem in our survey data. We start with Harman's one-factor test on the main independent constructs included in our study. We find multiple factors, the first of which does not account for the majority of the variance (explained variance = 0.299). Additionally, we added a latent construct called 'common method variance (CMV)' and ran several parsimonious CFAs including a CMV construct explaining the items of each construct in Appendix A. CMV is not significantly related to any of the dependent variables and the coefficients of independent variables remained unchanged, except for the effect of perceived entrepreneurship education support in Model 6 that went from being significant at a p-value = 0.072 to being insignificant at a p-value = 0.117. This minor effect of CMV, however, does not affect our main findings. After all these post hoc statistical tests and our careful a-priori approach to build the questionnaire, we believe that common method bias is not a major problem in our survey data and conclude that the evidence supports the assumption that common method bias does not account for the relationship between entrepreneurship education, and feasibility, desirability, and intentions for technology entrepreneurship.

Statistical Procedures to Test Hypotheses

Our analytical approach includes mediation analysis and we follow Hayes's (2013) procedures as recommended by Köhler *et al.* (2017). First, in models 1 to 3, we analyze the relationship between entrepreneurship education and feasibility, desirability, and intentions for technology entrepreneurship. Second, in models 4 to 6, we test the relationship between entrepreneurship education and intentions for technology entrepreneurship through the mediation of feasibility and

desirability. Given that feasibility and desirability are highly correlated, we enter them separately in models 4 and 5 to test their individual mediating role. However, in model 6, we enter both feasibility and desirability simultaneously as mediating variables. In robustness checks, we also orthogonalize feasibility and desirability to eliminate their correlation.

Third, we test for the significance of indirect effects (i.e., the effects of entrepreneurship education on intentions for technology entrepreneurship through the mediation of feasibility and desirability). We employ bootstrap confidence intervals and follow Hayes's (2013, p.106, 112) steps. In particular, this study estimates bootstrap bias corrected confidence interval estimations for indirect effects using 10,000 random samples.

To test our models 1 and 2, we use ordinary least squares with robust standard errors because the scaling measurement of the dependent variables (namely feasibility and desirability) and their normal distribution (mean = 0 and standard deviation = 1) permit this procedure. Additionally, to test models 3 to 6, we employ logistic regressions with robust standard errors given that the measurement of the dependent variable (intentions for technology entrepreneurship) is binary.

Results

Descriptive Statistics

Sample descriptive statistics are presented in Table 2. Approximately 35% of STEM university students in our sample have the intention to start a technology business. About 29% have taken an entrepreneurship course within the program or within the university. Thirty-six percent of students are females, and 34% have professional experience in the technology sector.

[Insert Table 2 here]

Pearson correlations are included in Table 3. Feasibility, desirability, and intentions for technology entrepreneurship are all significantly and positively correlated among themselves. Entrepreneurship education course, perceived entrepreneurship education support, role models in entrepreneurship courses, perception of the entrepreneurship environment and social network support are positively and significantly correlated with feasibility. Desirability is significantly and positively correlated with entrepreneurship education course, perceived entrepreneurship education support and social network support. Intentions for technology entrepreneurship are positively correlated with entrepreneurship education course, perceived entrepreneurship education support, role models in entrepreneurship courses, gender, perception of the entrepreneurship environment and social network support.

[Insert Table 3 here]

Testing Hypotheses H1a and H1b: Entrepreneurship Education and Feasibility

Table 4 provides details of our empirical estimations. In model 1, we test for the influence of entrepreneurship education on feasibility. Results show that perceived entrepreneurship education support (.165, $p<.01$) and role models in entrepreneurship courses (.091, $p<.01$) are significantly related to feasibility. Entrepreneurship education course (.151, $p<.114$) is marginally significant. These results support H1a that entrepreneurship education positively affects feasibility among STEM students.

While gender does not have a significant effect on feasibility, gender positively moderates the relationship between entrepreneurship education course and feasibility (.409,

p<.015). Gender, however, does not moderate the relationship between perceived entrepreneurship education support and feasibility nor the association between role models in entrepreneurship courses and feasibility. These results partially support H1b which states that the relationship between entrepreneurship education and feasibility among STEM students is stronger for females compared to males. Figure 2a shows that the relationship between entrepreneurship education course and feasibility has a positive slope for the group of female students, and a slightly negative slope for the group of male students[3]. This graph corroborates our moderating findings.

[Insert Table 4 here]

Testing Hypotheses H2a and H2b: Entrepreneurship Education and Desirability

In model 2, Table 4, of the entrepreneurship education variables, only perceived entrepreneurship education support has a positive relationship with desirability (.11, p<.005). This result partially supports H2a that entrepreneurship education positively affects desirability among STEM students.

In model 2, gender positively moderates the relationship between entrepreneurship education course and desirability (.399, p<.019). Gender also marginally moderates the relationship between role models in entrepreneurship courses and desirability (.139, p<.11). Gender, however, does not moderate the relationship between perceived entrepreneurship

[3] To test whether the effect of entrepreneurship education (entrepreneurship course) on feasibility and desirability is significantly negative for male students, we run group analyses. Particularly, we run separate models for the male student sample and for the female student sample. We find that having taken an entrepreneurship course has non-significant effects on feasibility (-0.0295, p-value = 0.788), desirability (-0.0726, p-value = 0.537), and intentions (0.012, p-value = 0.828) in the male student group. In the female student group, those effects are positive and significant at $p < 0.05$.

education support and desirability. Altogether, these findings partially support H2b that the relationship between entrepreneurship education and desirability among STEM students is stronger for females compared to males. In additional analyses, figure 2b reveals that the relationship between entrepreneurship education course and desirability is stronger for the female group than for the male group, confirming our moderating results.

[Insert Figure 2 here]

Testing Hypotheses H3a and H3c: Entrepreneurship Education and Intentions for Technology Entrepreneurship

In model 3 of Table 4, entrepreneurship education course (.377, p<.04) and perceived entrepreneurship education support (.222, p<.009) are significantly and positively related to intentions for technology entrepreneurship. These findings support H3a that entrepreneurship education positively affects intentions for technology entrepreneurship among STEM students.

Gender, in model 3, positively and significantly moderates only the relationship between entrepreneurship education course and intentions for technology entrepreneurship (.804, p<.027). This result partially supports H3b that the relationship between entrepreneurship education and intentions for technology entrepreneurship among STEM students is stronger for females compared to males. Figure 2c confirms this result and shows that entrepreneurship education course increases the probability of intentions for technology entrepreneurship in the female group more than that in the male group.

Testing Hypothesis H3b: Mediation of Feasibility and Desirability

Shapero and Sokol's (1982) model positions feasibility and desirability as mediators that impact entrepreneurial intentions. Therefore, we also run mediation analyses to test the impact of entrepreneurship education on intentions for technology entrepreneurship through the effects on feasibility and desirability. Table 4, models 4 to 6, presents the mediation results. Table 5 summarizes direct and indirect effects of entrepreneurship education on intentions for technology entrepreneurship.

Entrepreneurship education course affects intentions for technology entrepreneurship directly and indirectly. In models 4, 5 and 6, table 4, entrepreneurship education course significantly and directly affects intentions for technology entrepreneurship. Entrepreneurship education course also affects intentions for technology entrepreneurship through the mediation of feasibility. In Table 4, model 4, feasibility affects intentions for technology entrepreneurship (.606, p<.000), and in model 1, entrepreneurship education course affects feasibility (.132, p<.113). The indirect effect of entrepreneurship education course on entrepreneurial intentions is .07999. As mentioned earlier, we tested the significance of this indirect effect following Hayes's (2013) steps and using 10,000 random samples. In table 5, the indirect effect of entrepreneurship education course has a bias corrected confidence interval that lies between .00017 and .169, at 89% confidence level. In other words, entrepreneurship education course affects intentions for technology entrepreneurship by increasing feasibility.

Entrepreneurship education course is also indirectly related to intentions for technology entrepreneurship through the moderated mediation of feasibility and desirability. In Table 4, model 4, feasibility positively affects entrepreneurial intentions (.606, p<.000); and in model 1, the interaction between entrepreneurship education course and gender influences feasibility (.409, p<.014). Table 5 shows that the indirect effect (.248) of entrepreneurship education course

on intentions for technology entrepreneurship via the mediated moderation of entrepreneurship education course and gender on feasibility is significant at 95% confidence interval. In a similar vein, Table 5 indicates that the indirect effects (.541 and .527) of entrepreneurship education course on intentions for technology entrepreneurship via the mediated moderation of entrepreneurship education course and gender on desirability is significant at 95% confidence interval.

Perceived entrepreneurship education support has a direct and indirect effect on intentions for technology entrepreneurship. In models 5 and 6, Table 4, perceived entrepreneurship education support has a direct effect on intentions for technology entrepreneurship. Additionally, perceived entrepreneurship education support also shows indirect effects on intentions through feasibility and desirability. Following Hayes (2013) and using 10,000 random samples, Table 5 indicates positive and significant bias corrected indirect effects of perceived entrepreneurship education support on intentions for technology entrepreneurship through feasibility (.09999) and desirability (.149 and .145).

Role models in entrepreneurship courses only affect intentions for technology entrepreneurship indirectly. Table 5 reveals that bias corrected indirect effect of role models in entrepreneurship courses via feasibility (.0551) is statistically significant. Table 5 also shows that role models in entrepreneurship course have indirect effects (.1886 and .1836) on intentions for technology entrepreneurship via the mediated moderation with gender on desirability, at 89% confidence level.

Altogether these findings indicate that entrepreneurship education has direct effects on intentions for technology entrepreneurship when it is measured as entrepreneurship education course or perceived entrepreneurship education support. Additionally, findings reveal that all

components of entrepreneurship education show indirect effects on entrepreneurial intentions via feasibility and desirability. These findings support H3b which states that the relationship between entrepreneurship education and entrepreneurial intentions will be mediated by feasibility and desirability.

[Insert Table 5 here]

Of the control variables, social network support is positively associated with feasibility (.065, p<.000), desirability (.037, p<.053) and intentions for technology entrepreneurship (.261 to .292, p<.000). Perception of the entrepreneurship environment in Bulgaria is associated with feasibility (.052, p<.035). Age is negatively related with desirability (-.021, p<.004) and intentions for technology entrepreneurship (-.029, p<.085). All models are statistically significant, and models 5 and 6 have the highest R^2.

Additional Analysis

Intrigued by the fact that participation in entrepreneurship education course has the strongest interaction with gender, we performed several post-hoc analyses reported in Table 6 (one-way ANOVA) and two-stage Heckman regressions to control for sample selection bias (available on request). Those post-hoc analyses make use of two additional questions that were asked to students who had registered in an entrepreneurship course. These questions include perceptions about the content of the course and entrepreneurship course results. Comparing female and male respondents' perceptions about the content of entrepreneurship courses, we find that female respondents value more than their male counterparts the specific content of the entrepreneurship course, such as the generation of business ideas and discovery of entrepreneurial opportunities,

registration and organization of the new enterprise, management and development of the new enterprise. Two-stage Heckman regressions [following the process suggested by Certo *et al.* (2016)] consistently show that female respondents more than their male counterparts take an entrepreneurship education course ($p \leqq 0.001$), and that women students significantly value the generation of business ideas and discovery of entrepreneurial opportunities more than men ($p = 0.08$).

From Table 6, female respondents also perceive to get more results out of the entrepreneurship course they registered in, such as increased understanding of attitudes, values and motivations of entrepreneurs, actions someone has to take to start a business, and ability to identify an opportunity. Heckman regressions confirm that women more than men get more results from an entrepreneurship course, particularly as it relates to increasing an understanding of the attitudes, values and motivation of entrepreneurship ($p = 0.092$) and enhancing their abilities to identify an opportunity and when they need to act ($p = 0.084$, one-tailed test).

[Insert Table 6 here]

Robustness Checks

We perform several robustness checks. First, we use an alternative measure of entrepreneurial intentions. The survey also asks whether students think they will start a business (not necessarily a technology business). Approximately, 39% of respondents answered yes to this question. We re-run models 3 to 6 of Table 4. Forty-seven out of 52 coefficients have the same sign and significance. The only differences include the following. Perceived entrepreneurship education support is no longer significant on entrepreneurial intentions in models 5 and 6; and perception

of the entrepreneurship environment becomes significant in models 3, 5 and 6. We conclude that our main results do not change significantly after this robustness check.

Second, given that feasibility and desirability are highly correlated, we orthogonalized these variables using principal component analysis with varimax rotation. Eigenvalue of desirability is 3.64 and explains .455 of the variance. Eigenvalue of feasibility is 1.547 and explains .1934 of the variance. KMO is .809. We re-run model 6 and find that feasibility does not affect entrepreneurial intentions (.124, p>.224); however, desirability does affect entrepreneurial intentions (1.368, p<.000). These results confirm our main findings of model 6.

Third, we employ propensity score matching (PSM) (Rosenbaum and Rubin, 1983) and re-run models 1 to 6. First, we created comparative sub-samples of participants who took an entrepreneurship course and those who did not. PSM matches respondents who enrolled and those who did not enroll in an entrepreneurship course based on the propensity score, which we compute by running a probit model on observable variables. We specifically run PSM using the following observable variables from this study: gender, age, professional experience, perceptions of the entrepreneurship environment, and social network support. We estimate the likelihood of being selected into the treatment group. Six responses did not match and were dropped for further regression analysis. Tests confirmed that our overall matching quality was good. T-tests for each variable between the two groups indicate that all differences were insignificant at 5% p-value; the pseudo-R^2 of the probit model dropped to 0.007 for the matched sample, which provide a good indication of our model (Rosenbaum and Rubin, 1983). We then re-run 6 models as per Table 4 including propensity matching scores as weights in the models. Results indicate that coefficients of models 1, 2 and 3 remain with the same signs and statistical significance, except that professional experience in model 2 is now significant at p = 0.076. In models 4, 5 and

6, the effect of the variable entrepreneurship education course becomes more significant at p = 0.059, p = 0.038 and p = 0.042, respectively. Altogether, these additional results provide robustness to our main findings.

Discussion, Limitations, and Future Research Directions

The gender gap in technology entrepreneurship continues to be a concern for policy makers and academics alike (e.g., Dilli and Westerhuis, 2018; European Commission, 2018b; Kuschel *et al.*, 2020). In this paper, we address this issue by examining the effect of entrepreneurship education on the desirability and feasibility of an entrepreneurial career, and subsequent intentions to start a technology business among female and male STEM students. Previous research on the link between entrepreneurship education and determinants of entrepreneurial activities, such as entrepreneurial intentions and entrepreneurial self-efficacy has yielded mixed results with regard to their gendered effects. For example, Wilson *et al.* (2007), van Ewijk and Belghiti-Mahut (2019), and Nowinski *et al.* (2019) found that entrepreneurship education is more helpful for female students to boost their interest and perceived abilities to be entrepreneurs, while Joensuu et al. (2013), Shinnar *et al.* (2014), Westhead and Solesvik (2016), and Packham *et al.* (2010) report that education is more conducive to entrepreneurial intentions for males. However, those studies do not take into account the contextual specificities of the male-dominated industry embeddedness of technology entrepreneurship, and as such they do not provide insights about 'double trouble' situations where women are negatively stereotyped and outnumbered both in entrepreneurship and technology (van Veelen *et al.*, 2019). On the other hand, studies examining the effect of education on entrepreneurial intentions in the context of STEM (Maresch *et al.*, 2016; Souitaris *et al.*, 2007) do not theorize gender effects. Yet, the double social incumbrance at

the intersection of STEM and entrepreneurship presents a challenging situation and we lack understanding about the ability of entrepreneurship education to counteract gendered socialization (and its corresponding effect on behavior) in the field of STEM-related entrepreneurship. Recent qualitative research in STEM entrepreneurship points to the important role of mentorship (Elliott *et al.*, 2020), but we lack a systematic investigation into the role of education for shaping female STEM students' entrepreneurial aspirations. Thus, we contribute to the literature on entrepreneurship education and women entrepreneurship by offering a context-specific theoretical model and empirical test on the role of entrepreneurship education for desirability and feasibility of technology entrepreneurship for female STEM students, and consequently their intention to start a technology venture. Furthermore, while most of the literature has used a narrow operationalization of entrepreneurship education (e.g., participation in a course related to entrepreneurship), we expand this operationalization to test three different measures (entrepreneurship course, role models, and entrepreneurship support from the university), and we supply empirical evidence about which of those are most promising as a way of increasing female STEM students' entrepreneurial perceptions and intentions. Our findings offer three key contributions which we discuss next, along with their policy implications.

Theoretical Contributions

In our *first* contribution, our model focused on two theoretical mechanisms (feasibility and desirability) that are conditioned by gendered socialization and affect female STEM students' intentions to start a technology venture. Our study demonstrates that entrepreneurship education, measured as participation in an entrepreneurship course, has a stronger impact on

intentions for technology entrepreneurship for female students compared to male students. Thus, entrepreneurship education has the potential to help reduce the gender gap in technology venturing. Importantly, entrepreneurship education has a positive effect on both desirability and feasibility. Therefore, entrepreneurship education impacts not only the extent to which female students perceive an entrepreneurial career in technology entrepreneurship as desirable, but also helps female students to increase their perceived ability to be a technology entrepreneur. The effect on feasibility of technology entrepreneurship is especially important given gendered socialization that leads to occupational gender typing (Díaz-García *et al.*, 2016) and reduced perceived self-efficacy among women, especially in fields perceived as gender-incongruent (Wieland *et al.*, 2019). Recent research suggests that the lower level of entrepreneurial self-efficacy among women is not necessarily related to under-confidence in their abilities, but rather reflects accurate assessment of their expertise in venture creation (Jennings *et al.*, 2022). By giving an opportunity to engage in entrepreneurship-related tasks, entrepreneurship education builds confidence in students' ability to perform those tasks successfully in the future, such as identifying an opportunity, pitching a business idea, or writing a business plan (Shinnar *et al.*, 2014).

Of note is also the effect of entrepreneurship education (measured as course participation) on desirability. In the context of post-communist economies – the context of our study – women entrepreneurs have had to redefine what is possible and desirable, since traditional gender norms have long positioned entrepreneurship as a desirable career for men only (Welter *et al.*, 2006). It is well-recognized that entrepreneurship is contextually embedded and that interactions with the context determine women's entrepreneurship (Yousafzai *et al.*, 2019). Thus, the positive impact of entrepreneurship education on desirability is a promising finding in tune with recent trends of

increasing entrepreneurial engagement by women in post-communist economies. Desirability was also found to mediate the relationship between entrepreneurship education and intentions for technology entrepreneurship. Therefore, efforts to improve the image of entrepreneurship as a socially desirable career choice among STEM female students can potentially have beneficial effects on closing the gender gap in technology venturing. More research on actual entrepreneurial behavior would be especially relevant in technology entrepreneurship to understand why female graduates shun to pursue a technology entrepreneurial career despite being well equipped through STEM education.

In our *second* contribution, we highlight the importance of different entrepreneurship education measures and content. In doing so, we join recent calls for unraveling what types of entrepreneurship education activities are best suited for women (Padilla-Angulo *et al.*, 2022). Our study also responds to calls from Mosey *et al.* (2017) for more research exploring the role of entrepreneurship education and university support measures for the generation of talent and the experience of individuals in relation to technology entrepreneurship. Our results reveal that female respondents tended to value more than their male counterparts the specific content/aspects in entrepreneurship courses, and perceived to get more benefits out of it. The most useful content for female students would be content that increases their understanding of attitudes, values and motivations of entrepreneurs, actions someone has to take to start a business, and ability to identify an opportunity, practical management skills to start a business, and ability to develop networks. Past research highlights the role of practical-oriented pedagogy for enhancing students' entrepreneurial learning outcomes (Hahn *et al.*, 2017). Hence, entrepreneurship education should go beyond promoting awareness and providing knowledge (Ahmed *et al.*, 2017) and should focus on real-world experience, action, and reflection in order

to increase entrepreneurial intentions and eventually to enhance entrepreneurial performance (Kassean *et al.*, 2015). Our results underscore the importance of such practical content (steps needed to start a business, practical management skills, developing networks), but also point to the need for increased understanding about the psychological aspects of entrepreneurship (motivations, attitudes). Decisions about entrepreneurship content (Henry, 2020) should therefore be approached carefully with a view on what entrepreneurship course designs can deliver the most benefits for female STEM students.

Interestingly, of the three measures of entrepreneurship education, only participation in an entrepreneurship course was found to have a statistically significant interaction with gender. The other two measures - perceived entrepreneurship education support and role models – did not show significant moderating effects with gender. Thus, it appears that the aspect of being able to learn about and practice entrepreneurship skills is the most important differentiator for women, at least in our context. From a policy and educational perspective, the 'enactive mastery' element of self-efficacy beliefs (Wood and Bandura, 1989), therefore, needs to be the focus. It appears that this element may be able to counterbalance the effects of gendered socialization and motivate female STEM students to pursue technology entrepreneurship careers. While role models and perceived support may have their role to play, female STEM students tended to value more the knowledge and skills gained by participating in an entrepreneurship course. In contrast to our results, Padilla-Angulo *et al.* (2022) suggest that 'inspirational triggers' (Souitaris *et al.*, 2007), i.e., meeting role models such as recent or young entrepreneurs, are only effective for developing a positive attitude toward entrepreneurship in female students (and not in males). However, literature recognizes that role models are most effective when they are in some way relatable and students can identify with them, and female students might benefit from female

speakers (Rocha and Praag, 2020). Given that STEM and technology entrepreneurship are male-dominated, most of the role models students are exposed to are likely to be male. This might explain why we did not find a significant moderation effect. This result again underscores the importance of acknowledging context specificities and the ability of different entrepreneurship education measures to motivate female STEM students to pursue entrepreneurial careers.

In our *third* contribution, we enrich intentionality models by focusing on the intersection of sector (STEM) and gender, thus integrating contextual situations (Donaldson, 2019; Llados-Masllorens and Ruiz-Dotras, 2022). Research on entrepreneurial intentions has posited that intentions are shaped by personal factors such as perceived abilities as well as cultural and social contexts (Bird, 1988; Shapero and Sokol, 1982). Our findings underscore the importance of attending to the relationship between individual action and the social structure in which entrepreneurs are embedded, with an emphasis on how education can help women counteract some of the structural constraints of gendered socialization. As such, we contribute to a richer theoretical understanding of entrepreneurial intentions by focusing on the interplay of gendered societal structures and personal agency, and how those can condition the impact of entrepreneurship education on entrepreneurial intentions for technology entrepreneurship. Our theorizing and empirical results acknowledge the need to challenge societal gender role expectations around technology entrepreneurship. While entrepreneurship education can affect one piece of the puzzle - female STEM students' intentions for technology venturing, the social desirability of such a career for women is still embedded in broader societal norms and expectations within which female STEM students have to navigate their way.

Limitations and Future Research Directions

We should caution that although our findings point to a positive effect of entrepreneurship education on women's intentions for technology entrepreneurship, other studies have questioned both conceptually and empirically the ability of entrepreneurship education to achieve such effects (Sharen and McGowan, 2018; Siivonen *et al.*, 2022). Thus, entrepreneurship education should be contextualized. Given the paucity of research on the topic (Nabi *et al.*, 2017), it is important that future research examine entrepreneurship education programs across countries and other contexts to assess their ability to reduce gender gaps in technology entrepreneurship. Walter and Block (2016) found that entrepreneurship education has stronger relationship with entrepreneurial activity in institutional environments that are more entrepreneurship-hostile. In such an environment, the authors argue, more persistence and know-how are needed to start a venture, and entrepreneurship education is important to perceive entrepreneurial activity as more feasible; conversely, in entrepreneurship-friendly contexts, there is sound legal framework and lower barriers to entrepreneurship, and thus lower need for entrepreneurship education as an input to the process. Our institutional context is Bulgaria – a former communist country that has undergone a transition to a market economy. In such institutional environments, entrepreneurship has long had negative connotations and has been considered a male territory. Education, thus, seems to be especially important to counteract such perceptions. The extent to which entrepreneurship education can have similar effects for female STEM students in other institutional environments is open for future inquiry. Furthermore, our sample consists of students in STEM fields; women in STEM have already challenged traditional gender roles by entering a male-typed education field. Thus, their receptiveness towards entrepreneurship education (another male-typed field) might be higher compared to female students in other fields. Cross-country studies of the effect of entrepreneurship education on

female students' intentions to enter entrepreneurship across different fields (both STEM and non-STEM related) can bring increased understanding about the potential heterogeneity of effects of entrepreneurship education on entrepreneurial intentions for women.

While our study contributes significantly to women entrepreneurship education in STEM, we assume a correlation between entrepreneurial intentions and entrepreneurial behavior. Future studies should include actual entrepreneurial behavior to have a more complete picture of the influence of entrepreneurship education. In the past, studies have used experiments to approximate the behavioral implications of entrepreneurship education (e.g., DeTienne and Chandler, 2004; Souitaris *et al.*, 2007). We also encourage the use of longitudinal studies to further identify the intricacies of entrepreneurial education's effect on entrepreneurial behavior. For instance, studies may be grounded in imprinting theory to further understand the imprinting process and lasting influence of entrepreneurship education (Marquis and Tilcsik, 2013; Simsek et al., 2015). These studies can be done using qualitative research, longitudinal surveys or assembling panel data sets using secondary sources. We should also acknowledge that, following other studies examining gender effects of entrepreneurship education (e.g., Padilla-Angulo *et al.*, 2022; van Ewijk and Belghiti-Mahut, 2019), we focus on biological sex as our measure, instead of on gender as masculine or feminine identity independent of a person's biological sex. Future research can focus on gender identity and examine perceptions of masculinization in the STEM field as a potential moderator.

We should further note that while entrepreneurship education course had a positive effect on feasibility, desirability, and intention to start a technology venture for female STEM students, it did not have a significant effect on male students. It is possible that male students - irrespective of taking or not taking an entrepreneurship course - might have more positive intentions to start a

technology enterprise. Following our theorizing based on social role theory and social expectations, these students may feel confident they have the necessary skills to be an entrepreneur and are attracted by an entrepreneurial career path, and taking an entrepreneurship course may not add additional impetus to pursue a technology venture. This reasoning is in line with Elliot et al.'s (2021) findings that "male students perceive themselves to be significantly more similar to successful entrepreneurs … students with high entrepreneurial intent, (more of whom were men), rated themselves more highly on masculine descriptors and media images most commonly associated with being entrepreneurial – innovativeness, risk-taking and opportunity recognition" (p. 65). In this sense, fine-grained conceptualizations of entrepreneurship education will help us understand the role of entrepreneurship education not only for females but also for male STEM students. In additional analyses, we found that perceived entrepreneurship education support (another measure of entrepreneurship education) has a positive and significant effect on feasibility (0.154, p-value = 0.001), desirability (0.134, p-value = 0.007) and intentions (0.0495, p-value = 0.032) in the male student sample. Therefore, future research can investigate the gendered effect of different measures of entrepreneurship education for both female and male students to understand what aspects of entrepreneurship education motivate different groups of students.

Conclusions

Women entrepreneurs in STEM fields are well positioned to contribute to innovation and bring change to long-held stereotypes about the desirability and feasibility of technology entrepreneurial careers for women. Yet, there is a persistent and troubling gender gap in STEM occupations, including entrepreneurship. The findings from our study suggest that

entrepreneurship education could help reduce this gap. Attention should be paid to the specific measurement of entrepreneurship education. In the context of this study, only participation in an entrepreneurship course had a significant effect for female STEM students, while other measures (e.g., role models) did not. As more women enter STEM occupations and enlarge the pool of role models that female STEM students can identify with, this result may change. We hope that our research will spark more studies into measures to reduce the gender gap in high-performing, innovation-driving industries.

Data Availability Statement: The data that support the findings of this study are available from the authors upon reasonable request.

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Table 1. Operationalization of variables

Variable	Operationalization	Measurement	Source
Feasibility	- How practical is it for you to start your own [technology] business? (not very practical - very practical) - How hard do you think it would be to start your own [technology] business? (very hard - very easy) - If you started your own [technology] business, what do you think your workload would be? (very high-very low) - If you start your own business, how certain of success are you? (very certain of failing … very certain of success) - Do you know enough to start your own [technology] business? (know absolutely nothing - know everything)	7-point Likert scale Cronbach's alpha = .744	Drennan et al. (2005); Krueger (1993); Krueger et al. (2000); Shapero and Sokol (1982)
Desirability	- How attractive is it for you to start your own [technology] business? (very unattractive - very attractive) - If you started your own [technology] business, how would you feel about doing it? (I'd hate doing it - I'd love doing it) - If you started your own [technology] business, how enthusiastic would you be? (very unenthusiastic - very enthusiastic)	7-point Likert scale Cronbach's alpha = .806	Drennan et al. (2005); Krueger (1993); Krueger et al. (2000); Shapero and Sokol (1982)
Intentions for technology entrepreneurship	Do you think you'll ever start a technology business?	0: No, 1: Yes	Krueger (1993)
Entrepreneurship education course	- Having taken or taking an entrepreneurship course within your program of studies - Having taken or taking an entrepreneurship course outside the current program but within the university	0: No, 1: Yes	Souitaris et. al. (2007)
Perceived entrepreneurship education support	- My university offers elective courses on entrepreneurship - My university offers project work focused on entrepreneurship - My university offers internship focused on entrepreneurship - My university offers a bachelor or master study on entrepreneurship - My university arranges conferences /workshops on entrepreneurship - My university brings entrepreneurial students in contact with each other - My university creates awareness of entrepreneurship as a possible career choice - My university motivates students to start a new business - My university provides students with ideas to start a new business - My university provides students with the knowledge needed to start a new business	7-point Likert scale, from 1: totally disagree to 7: totally agree. Cronbach's alpha = .955	Saeed et. al. (2015)
Role models in entrepreneurship courses	- To what extent have you had the opportunity to receive information and to meet successful entrepreneurs during your academic training in the current program? - Industry partners gave lessons at our faculty - Industry partners held presentations at our faculty	7-point Likert scale, (7: very large extent; or 1: very rarely to 7: very often). Cronbach's alpha = .741	Walter et al. (2013)
Gender	Respondent's biological sex	0: Male; 1: Female	Westhead and Solesvik (2016)
Age	Age in number of years	Number of years	Walter and Block (2016)
Professional experience	Do you have previous professional experience in technology company?	0: No; 1: Yes	Souitaris et. al. (2007)
Perception of the entrepreneurship environment	Perception of the entrepreneurship environment in Bulgaria (from 1: extremely unfavorable to 7: extremely favorable)	7-point Likert scale	Walter and Block (2016)
Social network support	Support from family and friends (from 1: no support to 7: full support)	7-point Likert scale	Walter et al. (2013)

Table 2. Descriptive statistics (n = 827)

Variables	Mean	Standard deviation	Minimum	Maximum
1. Feasibility	-.002	1.004	-2.307	3.178
2. Desirability	-.000	1.006	-3.183	1.459
3. Intentions for technology entrepreneurship	.349	.477	0	1
4. Entrepreneurship education course	.293	.455	0	1
5. Perceived entrepreneurship education support	-.005	.999	-1.572	2.343
6. Role models in entrepreneurship courses	-.000	1.004	-1.276	2.641
7. Gender	.363	.481	0	1
8. Age	23.265	5.263	18	53
9. Professional experience in technology companies	.343	.475	0	1
10. Perception of the entrepreneurship environment	2.972	1.500	1	7
11. Social network support	5.232	1.885	1	7

Table 3. Pearson correlations (p-values in parentheses)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Feasibility	1										
2. Desirability	.523 (.000)	1									
3. Intentions for technology entrepreneurship	.318 (.000)	.458 (.000)	1								
4. Entrepreneurship education course	.164 (.000)	.065 (.061)	.164 (.000)	1							
5. Perceived entrepreneurship education support	.241 (.000)	.118 (.0007)	.167 (.000)	.226 (.001)	1						
6. Role models in entrepreneurship courses	.206 (.000)	.003 (.937)	.132 (.0001)	.313 (.000)	.356 (.000)	1					
7. Gender	-.005 (.879)	-.021 (.549)	.059 (.091)	.15 (.000)	.05 (.154)	.008 (.82)	1				
8. Age	-.053 (.127)	-.108 (.002)	-.086 (.014)	-.084 (.015)	-.072 (.038)	-.06 (.085)	-.07 (.044)	1			
9. Professional experience in technology companies	-.036 (.308)	.018 (.609)	-.033 (.338)	-.001 (.987)	.005 (.883)	.019 (.582)	-.143 (.000)	.323 (.000)	1		
10. Perception of the entrepreneurship environment	.155 (.000)	.037 (.289)	.122 (.0004)	.173 (.000)	.177 (.000)	.209 (.000)	.038 (.282)	-.074 (.034)	-.014 (.693)	1	
11. Social network support	.186 (.000)	.073 (.036)	.256 (.000)	.168 (.000)	.135 (.0001)	.198 (.000)	.117 (.001)	-.019 (.592)	-.045 (.201)	.195 (.000)	1

Note. n = 827

Table 4. Empirical findings (p-values in parentheses)

	Dependent variable (Model 1)	**Dependent variable (Model 2)**	**Dependent variable (Model 3)**	**Dependent variable (Model 4)**	**Dependent variable (Model 5)**	**Dependent variable (Model 6)**
Independent variables	**Feasibility**	**Desirability**	**Intentions for technology entrepreneurship**	**Intentions for technology entrepreneurship**	**Intentions for technology entrepreneurship**	**Intentions for technology entrepreneurship**
Mediation effects						
Feasibility				.606 (.000)		.072 (.536)
Desirability					1.357 (.000)	1.321 (.000)
Main effects						
Entrepreneurship education course	.132 (.113)	.079 (.362)	.377 (.04)	.309 (.103)	.378 (.063)	.367 (.072)
Perceived entrepreneurship education support	.165 (.000)	.11 (.005)	.222 (.009)	.139 (.126)	.18 (.062)	.173 (.072)
Role models in entrepreneurship courses	.091 (.028)	-.063 (.128)	.051 (.546)	-.017 (.844)	.084 (.407)	.071 (.491)
Gender	-.115 (.114)	-.099 (.174)	-.041 (.801)	.035 (.838)	.058 (.753)	.072 (.698)
Interaction effects						
Entrepreneurship education course x Gender	.409 (.014)	.399 (.019)	.804 (.027)	.592 (.188)	.551 (.179)	.517 (.21)
Perceived entrepreneurship education support x Gender	.023 (.777)	.058 (.479)	-.03 (.863)	-.028 (.881)	.102 (.607)	.104 (.603)
Role models in entrepreneurship courses x Gender	-.038 (.655)	.139 (.11)	-.053 (.762)	-.035 (.855)	-.265 (.201)	-.267 (.198)
Control variables						
Age	-.002 (.782)	-.021 (.004)	-.024 (.142)	-.029 (.085)	-.006 (.779)	-.007 (.751)
Professional experience in technology companies	-.067 (.361)	.116 (.138)	-.021 (.903)	.032 (.855)	-.166 (.405)	-.159 (.424)
Perception of the entrepreneurship environment	.052 (.035)	.009 (.715)	.077 (.153)	.044 (.43)	.091 (.147)	.084 (.184)
Social network support	.065 (.000)	.037 (.053)	.285 (.000)	.261 (.000)	.292 (.000)	.290 (.000)
Constant	-.441 (.019)	.234 (.255)	-1.893 (.000)	-1.604 (.002)	-2.589 (.000)	-2.536 (.000)
N	828	829	833	828	829	827
F or [Wald Chi^2]	9.75	3.54	[89.18]	[112.42]	[161.60]	[161.11]
R^2or [pseudo R^2]	.115 (.000)	.052 (.0001)	[.087 (.000)]	[.134 (.000)]	[.265 (.000)]	[.265 (.000)]
RMSE	.951	.986				
Log pseudolikelihood			-491.288	-463.728	-394.175	-393.39
Method	OLS with robust standard errors	OLS with robust standard errors	Logistic regression with robust standard errors	Logistic regression with robust standard errors	Logistic regression with robust standard errors	Logistic regression with robust standard errors

Table 5. Significant direct and bias corrected indirect effects

		Intentions for technology entrepreneurship (Model 4)	Intentions for technology entrepreneurship (Model 5)	Intentions for technology entrepreneurship (Model 6)
Entrepreneurship education course	Direct effect	.309[a]	.378†	.367†
	Indirect effects via:			
	Feasibility	.07999 (.00017; .169)[a]		
	Desirability			
	Entrepreneurship education x Gender → Feasibility	.248 (.052; .487)*		
	Entrepreneurship education x Gender → Desirability		.541 (.082; 1.052)*	.527 (.074; 1.012)*
Perceived entrepreneurship education support	Direct effect		.18†	.173†
	Indirect effects via:			
	Feasibility	.09999 (.023; .1997)***		
	Desirability		.149 (.0066; .294)**	.145 (.0063; .297)**
Role models in entrepreneurship courses	Direct effect			
	Indirect effects via:			
	Feasibility	.0551 (.008; .113)*		
	Role models in entrepreneurship courses x Gender → Desirability		.1886 (.00052; .38627)[a]	.1836 (.00052; .37753)[a]

[a]p≤.11; †p≤.10; * p≤.05; ** p≤.01; ***p≤.001. All indirect effects have been tested following Hayes (2013); bootstrap bias corrected estimations for indirect effects using 10,000 random samples. Bias corrected confidence intervals are between parentheses (lower bound; upper bound).

Table 6. Post-hoc Analysis, One-way ANOVA of Gender Differences

Variable	Mean for Male Group	Mean for Female Group	p-value	Barlett's test of equal variances: p-value
Entrepreneurship Course Content (n=251; 120 female):				
Generation of business ideas and discovery of entrepreneurial opportunities	4.115	4.575	0.03	0.488
Establishment, registration and organization of new enterprise	4.061	4.5	0.048	0.557
Management and development of new enterprise (including innovation, growth, internationalization)	4.267	4.65	0.094	0.299
Entrepreneurship Course Results (n=250; 120 female):				
Increase your understanding of the attitudes, values and motivation of entrepreneurship	4.285	4.792	0.006	0.519
Increase your understanding of the actions someone has to take in order to start a business	4.585	4.908	0.063	0.871
Enhance your practical management skills in order to start a business	4.277	4.408	0.501	0.696
Enhance your ability to develop networks (i.e. who do I need to know)	3.854	4.133	0.201	0.421
Enhance your ability to identify an opportunity (i.e. when do I need to act?)	3.908	4.492	0.007	0.78

Figure 1: Conceptual model

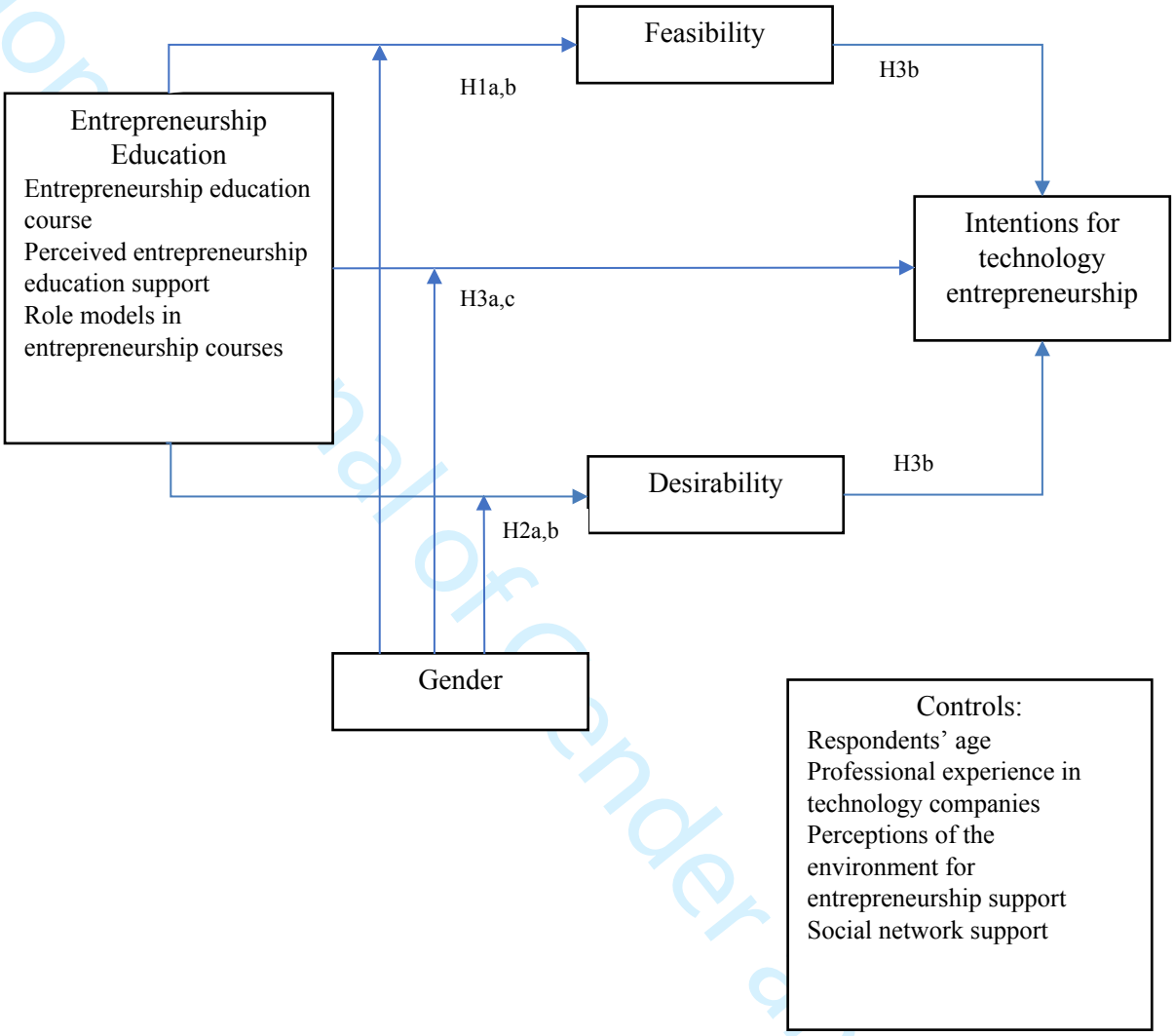
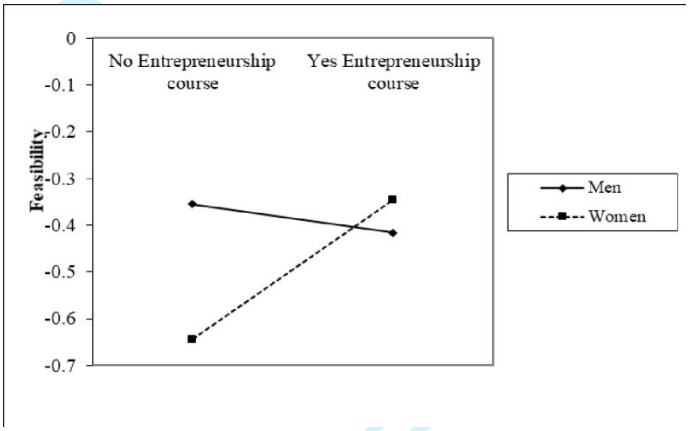
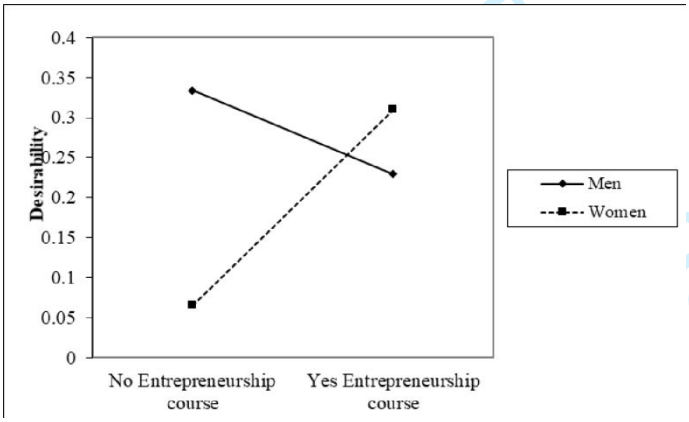


Figure 2. Moderation effects of gender

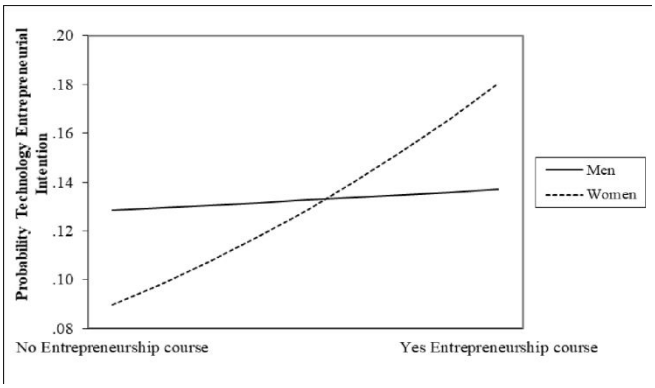
a. Model 1



b. Model 2



c. Model 3



Appendix 1: Standardized factor loadings, average variance extracted, and reliability of constructs

Constructs and Items for CFA	Mean (S.D.)	Factor Loading	AVE	Construct Reliability
Perceived entrepreneurship education support			0.683	0.956
My university offers elective courses on entrepreneurship	3.23 (1.74)	0.795		
My university offers project work focused on entrepreneurship	3.38 (1.76)	0.833		
My university offers internship focused on entrepreneurship	3.38 (1.77)	0.821		
My university offers a bachelor or master study on entrepreneurship	3.52 (1.86)	0.786		
My university arranges conferences /workshops on entrepreneurship	3.42 (1.76)	0.831		
My university brings entrepreneurial students in contact with each other	3.45 (1.79)	0.835		
My university creates awareness of entrepreneurship as a possible career choice	3.43 (1.79)	0.888		
My university motivates students to start a new business	3.42 (1.82)	0.878		
My university provides students with ideas to start a new business	3.42 (1.88)	0.83		
My university provides students with the knowledge needed to start a new business	3.47 (1.94)	0.762		
Role models in entrepreneurship courses			0.606	0.799
To what extent you had the opportunity to receive information and to meet successful entrepreneurs during your academic training in the current program?	3.66 (1.61)	0.321		
Industry partners gave lessons at our faculty	2.7 (1.87)	0.874		
Industry partners held presentations at our faculty	2.76 (1.91)	0.975		
Feasibility			0.362	0.732
How practical is it for you to start your own [technology] business? (not very practical - very practical)	4.53 (1.53)	0.687		
How hard do you think it would be to start your own [technology] business? (very hard - very easy)	2.6 (1.59)	0.472		
If you started your own [technology] business, what do you think your workload would be? (very high-very low)	2.63 (1.66)	0.487		
If you start your own business, how certain of success are you? (very certain of failing … very certain of success)	4.16 (1.51)	0.776		
Do you know enough to start your own [technology] business? (know absolutely nothing - know everything)	3.70 (1.42)	0.527		
Desirability			0.604	0.819
How attractive is it for you to start your own [technology] business? (very unattractive - very attractive)	4.67 (1.57)	0.667		
If you started your own [technology] business, how would you feel about doing it? (I'd hate doing it - I'd love doing it)	5.43 (1.39)	0.852		
If you started your own [technology] business, how enthusiastic would you be? (very unenthusiastic - very enthusiastic)	5.15 (1.61)	0.8		

Appendix 2: Covariance matrix and discriminant validity of constructs in CFA

	1	2	3	4
1. Feasibility	1.000	0.588	0.063	0.043
2. Desirability	0.767	1.000	0.015	0.000
3. Perceived entrepreneurship education support	0.250	0.123	1.000	0.091
4. Role models in entrepreneurship courses	0.207	0.013	0.301	1.000