**1. INTRODUCTION**

Despite a significant increase in women’s higher education attainment and labor market participation over the past several decades (Petrongolo & Ronchi, 2020; Goldin 2006), women are still significantly less likely than men to become entrepreneurs. While recent government policies to boost women participation in entrepreneurship have been implemented with some success (Bullough et al., 2019), women remain underrepresented in the entrepreneurial arena (Elam, 2008; Langowitz & Minniti, 2007), especially in high-growth sectors (Brush et al., 2014; Elam et al., 2019; Marlow & McAdam, 2011; Morris et al., 2006; Robb et al., 2014). Thus, it seems that women participation in high-growth entrepreneurship deserves its own attention to develop effective measures to provide equal opportunities.

In the Israeli high-tech sector, our focal entrepreneurial ecosystem, out of 26,541 innovative startup founders between 1997 and 2018, only 7.4% (1,957) were women (IVC Online Report, 2019). Only 6.9% of the companies’ CEOs were women, and only 5.7% of the financing deals involved startups led by women CEOs (IVC Online Report, 2018). These figures are far below the 40% representation of women in the local labor market, 29% in the local high-tech industry, 23% in R&D positions and 19% in R&D management positions in the local high-tech industry (SCI, 2021; SNC, 2021).

This low proportion is especially striking considering that women and men are similar in entrepreneurial intentions (Elam et al., 2019) and in level of innovativeness (DeTienne & Chandler, 2007), and given cumulative findings that gender per se does not explain firm performance (Dezsö & Ross, 2012; Du Rietz & Henrekson, 2000; Jennings & Brush, 2013; Lee & Marvel, 2014; Poggesi et al., 2016; Robb & Watson, 2012; Scott & Shu, 2017; Yousafzai et al., 2018; Zolin et al., 2013). Therefore, it is important to target and address those gender-related conditions that hinder female entrepreneurship.

Understanding the causes for women’s low participation rate in innovative entrepreneurship and identifying possible means to address these causes is of scholarly interest and public importance. Identifying the (entry and growth) challenges to female entrepreneurship and the possible means of overcoming them can help stakeholders, such as educators, policy makers, and program leaders, better align the support they provide with women’s specific needs, thereby more effectively increasing their participation in entrepreneurship. Reviewing the literature reveals various obstacles to female entrepreneurship. We have identified five main categories of such obstacles: a) low rates of entrepreneurial human capital; b) low-quality business networks; c) low levels of entrepreneurial self-efficacy and confidence; d) discrimination, stereotypes and legitimacy issues in the entrepreneurial ecosystem; and e) limited access to finance.

We propose that startup accelerators, a new form of entrepreneurial support system, might attract more female founders, as their organizational design can address these five obstacles that women meet. Accelerators are becoming increasingly important actors in the innovative entrepreneurial ecosystem, with approximately one-third of first-time founded startups in the United States (Chen, 2019), and about 20% of startups founded in Israel from 2011 through 2019 (based on our analysis of IVC 2020 data), were accelerator-backed startups. Thus, they can play a pivotal role in decreasing the gender gap in entrepreneurship.

This study grew out of our initial finding that the participation rates of female founders within startup accelerators in Israel are significantly higher than their participation rates in the general innovative startup population. This finding was based on a macro-level dataset of 71 startup accelerators active between 2011 and 2019 in Israel that includes the majority of accelerator startup graduates in the country at that time. According to this data, the average rate of female founders in Israeli accelerators (15.3%) is more than double that in the general population of innovative startup founders (7.4%).

This substantial difference motivated us to examine the design of accelerators through the lens of female entrepreneurs’ specific needs and to identify the mechanisms that explain how accelerators’ design match these needs and facilitate women’s successful integration in the Israeli high-tech sector. We suggest that this increased participation rate can be attributed to specific characteristics of startup accelerator that address the particular disadvantages of female entrepreneurs. To systematically examine the role of startup accelerators in female entrepreneurship, this study seeks to: describe the five main obstacles and resulting needs of female entrepreneurs; present the main design characteristics of accelerators, identifying which specific elements meet female entrepreneurs’ specific needs and how; and empirically test our assumptions.

This study contributes to the literature in several respects. First, it brings together and reviews the various barriers to female entrepreneurs, providing a comprehensive and concise overview of the challenges they face. In describing these barriers, we adopt Tatli et al.’s (2014) suggestion to consider relationality in the study of entrepreneurship, place the barriers in their broad social context, and highlight interrelations between them (see also Elam’s 2008 discussion of Bourdieu’s theory of action). Second, we present evidence that accelerators might be a significant tool for enhancing women’s participation as founders of innovative high growth startups. We do so by linking the elements of accelerators’ design to female founders’ specific needs, thereby suggesting some generalized policy implications for the field of female entrepreneurship. Third, we built and used a unique and rich dataset documenting the goals, experiences, and outcomes of 779 accelerator graduates in Israel’s high-tech sector from 2011 through 2019. Fourth, we provide evidence of the impact accelerators have on founders and on startup progress, as direct and immediate results of the program, rather than focusing on long-term outcomes (such as fundraising and successful exits), which are subject to selection issue, thus enriching the emerging literature on startup accelerators.

**2. LITERATURE REVIEW AND** **RESEARCH HYPOTHESES**

Before describing the five main barriers to female entrepreneurship, it should be emphasized that we are in no way suggesting that the disadvantages women face as entrepreneurs are due to gender per se. On the contrary, we cite evidence that gender in itself does not account for entrepreneurial success or firm performance. Consequently, we posit that due to social factors beyond the scope of this paper, such as discrimination, educational and occupational gender role socialization, or stereotypes (Eccles, 1994; Eccles, 2011; Tonoyan et al., 2020), women often begin their entrepreneurial careers at a disadvantage relative to men.

**2.1 Barriers to Female Entrepreneurs**

*Entrepreneurial Human Capital*. Human capital consists of the skills and knowledge individuals acquire through their education, on-the-job training, and other relevant experiences (Becker, 2009; Coleman, 1988). The literature distinguishes between general human capital—the overall educational level and general work experience—and domain-specific human capital, defined as education and experience in a particular domain, e.g., entrepreneurship (Becker, 2009). Studies show that entrepreneurial human capital (i.e., human capital specific to entrepreneurship) is more important than general human capital for entrepreneurial success (Rauch & Rijisdijk, 2013) and venture growth (Colombo & Grilli, 2005; Unger et al., 2011), and is especially critical for young ventures and novice entrepreneurs (Davidsson & Honig, 2003; Unger et al., 2011).

Entrepreneurial human capital is associated with entrepreneurial intentions (Bosma et al., 2004; Florin et al., 2003), may assist in opportunity identification and in accumulation of entrepreneurial knowledge and skills (Ucbasaran et al., 2008), is positively related to startup creation, growth, and survival (Cassar, 2006; Unger et al., 2011), and is negatively associated with startup failure (Cooper et al., 1994).

Women, while often having higher general human capital than men, are less likely to acquire formal education in business, finance, and STEM fields (Brush, 1992; Dutt & Kaplan, 2018; Elam, 2008; Elam et al., 2019; Menzies et al., 2004; Poggesi et al., 2020). Moreover, while first-time female and male entrepreneurs have, on average, similar previous work experience in terms of duration, women tend to have less business and managerial work experience when starting a business (e.g., Boden & Nucci, 2000; Brush et al., 2019). Their lack of relevant educational background and business experience places women at a disadvantage in the entrepreneurial process (Arenius & De Clercq, 2005; Dutt & Kaplan, 2018; Shane, 2003).

*Business Networks.* Networks refer to the social relationships that link individuals and build social capital (Coleman, 1988). Networks and social capital are crucial for entrepreneurial success (Greve & Salaff, 2003; Hoang & Antoncic, 2003). A high-quality network is a powerful asset for an entrepreneur, providing access to knowledge, potential customers, suppliers, partners, and investors (Elfring & Hulsink, 2003). A founder’s business network makes four important contributions to venture creation and development. First, it is an important source of new ideas, and helps identify business opportunities (Bhagavatula et al., 2010) and to design and implement growth strategies (McAdam & McAdam, 2006). Second, an entrepreneur’s network affects their ability to access necessary scarce resources (Elfring & Hulsink, 2003; Vohora et al., 2004). Third, high-quality networks and exposure to successful role models can enhance entrepreneurial self-efficacy (BarNir et al., 2011; McGee et al., 2009). Finally, networks and social capital enhancing legitimacy (Busenitz et al., 2005; Murphy et al., 2007).

Researchers have found that male and female entrepreneurs are embedded in different social networks, leading to divergent economic consequences (Brush et al., 2014; Moore, 1990; Renzulli et al., 2000). Women use their networks more for relationship-building, in contrast to men’s strategic and instrumental use (Ozkazanc‐Pan & Clark Muntean, 2018). Women also tend to have smaller and more homogeneous networks that include more relatives and friends, while men’s networks are larger, more heterogeneous, and include more professional colleagues (Greve & Salaff, 2003; Renzulli et al., 2000). Women face additional impediments to networking in male-dominated environments (Marlow & McAdam, 2011) and industries (Linehan & Scullion, 2008), such STEM-related fields (Poggesi et al., 2016, 2020). As a result, women have greater difficulty acquiring informal mentors (McGowan et al., 2015; Noe, 1988), and are often excluded from investor networks, thus finding it harder to secure capital (Brush et al., 2014; Guzman & Kacperczyk, 2019). Lastly, the distinctive structure of women’s networks leads to difficulties in connecting with reputable players, which can have an adverse impact on women’s legitimacy as entrepreneurs (McAdam et al., 2019). Exemplifying the importance of networks for female entrepreneurs, Tinkler et al. (2015) found that venture capitalists are less likely to discount female founders who have strong network with reputable actor in the ecosystem.

*Entrepreneurial Self-efficacy (ESE) and confidence*. Self-efficacy refers to an individual’s belief in their personal capabilities to successfully perform a specific job or set of tasks (Bandura, 1997, 2012). ESE relates to a person’s confidence in their ability to successfully launch an entrepreneurial venture (Boyd & Vozikis, 1994; Chen et al., 1998; McGee et al., 2009). ESE and confidence are strongly associated with entrepreneurial intentions and actions (Arenius & Minniti, 2005; BarNir et al., 2001; Bosma et al., 2012; Boyd & Vozikis, 1994; Chen et al., 1998; De Noble et al., 1999; Garaika et al., 2019; Krueger et al., 2000; Newman et al., 2019; Wilson et al., 2009; Zhao et al., 2005), growth aspirations (Hechavarría et al., 2012; Spigel, 2017), and revenue and employment growth levels (Baum & Locke, 2004; Mauer et al., 2017; Miao et al., 2017).

Research shows that women tend to have lower entrepreneurial confidence (Elam et al., 2019) and ESE (Baughn et al., 2006; Chen et al., 1998; Dempsey & Jennings, 2014; Wilson et al., 2009) than men. Across many countries, women tend to perceive themselves as less suited for entrepreneurship compared to men (Langowitz & Minniti, 2007). Women’s lower ESE is strongly linked to lower entrepreneurial intentions and outcomes (BarNir et al., 2011; Kickul et al., 2008; Wilson et al., 2007).

*Legitimacy.* The successful creation and development of a new venture depends on resources and support from many external actors (Elam et al., 2019; Fisher et al., 2017; Vohora et al., 2004; Zimmerman & Zeitz, 2002). For such actors to provide a new venture with necessary resources and support, they must perceive the founder and their venture as legitimate (De Clercq & Voronov, 2009; Fisher et al., 2017; Lounsbury & Glynn, 2001; van Werven et al., 2015) in terms of their congruency with social values, norms and expectations (Zelditch, 2001). Legitimacy is an important means for overcoming the liability of newness that contributes to the high percentage of failures of new ventures (Zimmerman & Zeitz, 2002). Thus, legitimacy plays a vital role in the formation, survival, and growth of new ventures (De Clercq & Voronov, 2009; Delmar & Shane, 2004; Lounsbury & Glynn, 2001; Zimmerman & Zeitz, 2002).

Gender stereotypes create barriers to female entrepreneurs in gaining legitimacy (Calás et al., 2009; Edelman et al., 2018). Indeed, women are also perceived by others as less suited for entrepreneurship compared to men (Langowitz & Minniti, 2007). The Gender Role Congruity Theory highlights the difficulties women face in gaining legitimacy in areas viewed as masculine fields. Accordingly, observers use different standards to evaluate men and women’s performance in gendered contexts (Eagly & Karau, 2002; Koch et al., 2015). Entrepreneurship, which is considered a masculine domain (Ahl, 2006; Gupta et al., 2009), dominated by masculine behaviors (Marlow & McAdam, 2011; McAdam et al., 2019) and masculine-specific values (Ahl, 2004; Tatli et al., 2014), poses legitimacy challenges for women (Eagly & Karau, 2002) when seeking financing (Eddleston et al., 2016; Edelman et al., 2018; Guzman & Kacperczyk, 2019; Marlow & Patton, 2005; Murphy et al., 2007), or when approaching potential high-skilled employees, suppliers, customers, and partners (Zimmerman & Zeitz, 2002).

*Access to capital*. Obtaining financial resources is essential for new ventures (Davila et al., 2003), and affects firm survival (Neeley & Van Auken, 2010), growth, and performance (Hellmann & Puri, 2000). Access to external sources of finance is even more crucial for innovative startups, that have high growth aspirations but suffer from a long “valley of death” (a long period with high expenditures and without revenues and earnings before commercialization; Auerswald & Branscomb, 2003). Obtaining such resources is crucial for new ventures (Kafeshani et al., 2018), allowing space for experimentation and exploration of business opportunities (Wiklund & Shepherd, 2005), and signaling the startup’s quality to the labor market (Davila et al., 2003) and to potential customers and partners.

Limited access to capital is a primary barrier to female entrepreneurship (Brush et al., 2018; Campanella & Serino, 2019; De Andrés et al, 2020; Guzman & Kacperczyk, 2019; Marlow & Patton, 2005). The venture capital (VC) industry, dominated by men, who constitute 94% of VC partners (Brush et al., 2014; Brush et al., 2018), suffers from a strong bias against women. According to PitchBook (2016),[[1]](#footnote-1) during 2016–2017, companies with female founders received only 4.4% of the VC deals and just 2% of VC dollars. Brush et al., (2018) show that only 2.7% of VC investments were secured by women CEOs, even though VC-backed companies with women CEOs perform just as well as those with male CEOs. Investors, often men, are also less likely to invest in companies helmed by women due to widespread bias against female entrepreneurs caused by legitimacy issues, gender stereotypes and gender homophily (Carter et al., 2007; Guzman & Kacperczyk, 2019; Jennings & Brush, 2013; Kanze et al., 2018; Marlow & Swail, 2014). Similar weaknesses might be viewed as more critical for women than for men (Ahl, 2006), leading potential investors to view female-founded ventures as less legitimate (Alsos & Ljunggren, 2017; Gupta et al., 2009; Morris et al., 2006). Investors prefer pitches of male entrepreneurs to those of female entrepreneurs with the same content (Brooks et al., 2014); loan officers employ different evaluation criteria for male and female entrepreneurs (Carter et al., 2007); and many women entrepreneurs with the requisite skills and experience to lead high growth ventures raise substantially less venture capital (Brush et al.,2014).

Biases against women are also evident in the questions that investors ask female and male founders. Kanze et al. (2018) found that investors tend to ask male entrepreneurs questions regarding potential success (i.e., promotion-focused questions), while female entrepreneurs are asked questions regarding failure (i.e., prevention-focused questions). The different questions influence male and female founders’ responses and, as a result, affect their likelihood of raising capital. These prejudices clash with the finding that while women entrepreneurs raise significantly less capital, they ultimately deliver significantly higher revenues per dollar invested (Abouzahr et al. 2018).

Another source of gender bias in access to capital may be attributable to the fact that many startups founded by women target women-related issues and markets (Elam, 2008), with which male investors are less familiar (Abouzahr et al., 2018; Coleman and Robb, 2009).

Overall, synthesizing the literature we have identified five obstacles that women in particular tend to face in their entrepreneurial careers: lower entrepreneurial human capital, lower quality business networks, low entrepreneurial confidence and self-efficacy (ESE), lower levels of legitimacy, and limited access to finance. We suggest that accelerators can help in overcoming these barriers and reducing the gender gap in entrepreneurship. The following section describes accelerators and their potential to overcome these obstacles.

**2.2 Accelerators’ Contribution to Startup Founders**

Accelerators act as short-term (three- to nine-month) “boot camps” for entrepreneurs (focusing mainly on high-tech ventures; Chen, 2019), offering a structured developmental and learning process that includes entrepreneurial training, mentoring services, and extensive business networks (Cohen et al., 2019a). Accelerators serve as intermediaries, connecting startups and investors, which reduces information asymmetry (Chen, 2019) and provide standing and legitimacy to entrepreneurs and startups.

We should note that while incubators (sometimes confused with accelerators) are also support systems that target novice entrepreneurs, their design differs substantially from that of startup accelerators (Cohen, 2013; Cohen et al., 2019a; Feld, 2020; Isabelle, 2013; Shankar & Clausen, 2020). Accelerators are distinct from incubators in four aspects: entrepreneurial training and educational component, intensive mentoring, focus on networks, and typical use of fast assumption validation processes, according to Lean Startup methodology (Mansoori et al., 2019; Shankar & Clausen, 2020). As such, our arguments may not be fully applicable to incubators.

Initial empirical evidence suggests that accelerators create value for entrepreneurs (Hallen et al., 2020; Crisan el al., 2019; Yu, 2020). Few studies examining the link between gender and accelerators’ impact have found mixed results (Chen, 2019; Dutt & Kaplan, 2018; Scott & Stu, 2017). We suggest that five supportive elements of accelerators: entrepreneurial training, mentoring, networking, legitimation signaling entity, and fundraising support and training, work independently and jointly to overcome the five barriers female entrepreneurs face. Accelerators can therefore increase the participation of women in entrepreneurial activities and contribute to their future success.

1. *Entrepreneurial training.* Accelerators provide either a shared formal educational program or a tailored educational component for each startup. These components provide hands-on practice on the technical and managerial aspects of creating and running a high-growth venture. Often, educational workshops are followed by hands-on practice with mentors and experts associated with the accelerator. This training can compensate for a founder’s lack of experience (Assenova, 2020; Chen, 2019) or lack of formal entrepreneurial education.
2. *Mentoring services.* Mentorship is an essential element of support that entrepreneurs receive in accelerators (Assenova, 2020; Kuratko et al., 2021; Yitshaki, 2020; Yitshaki & Drori, 2018). Mentorship serves two important functions: socio-psychological support and functional support (Kram, 1983; St-Jean & Audet, 2012). Entrepreneurs work with a wide array of mentors and experts who provide support for different aspects of the growing business. Each startup is typically assigned at least one mentor who gives the founders guidance, feedback, and advice, and who often acts as a role model (Ghorashi & Asghari, 2019; Yitshaki, 2020).
3. *Wide network base.* Accelerators provide extensive networks of professionals and potential partners and numerous opportunities for social interactions, all important for extending a founder’s networks (McAdam & McAdam, 2006). These networks also assist founders with access to pilots within large corporations, suppliers, valuable experts, and potential investors. In addition, accelerator managers and partners connect founders to local and global innovation ecosystems (Fehder & Hochberg, 2018) and offer access to an effective community of practice (Chen, 2019) in which founders can benefit from learning and networking opportunities (Hamilton, 2011; Peters et al., 2004; Wenger, 1999).
4. Legitimation signaling entity*.* Signaling theory highlights the need for entrepreneurs to signal their credibility and the viability of their new venture to capital providers, potential suppliers, customers, and partners (Busenitz et al., 2005; Murphy et al., 2007). Accelerators can act as such a signaling entity, especially considering that their average acceptance rate is lower than 5% (Chen, 2019). The continuous relationship with prestigious mentors and partners within the accelerator can also confer legitimacy for the participating founders and startups (Bangara et al., 2012; McKevitt & Marshall, 2015; van Werven et al., 2015).
5. *Fundraising support and training*. Accelerators often provide participants with financial support (Crisan el al., 2019), pitching and fundraising training (Miles et al., 2017; Moritz et al., 2021), and connect them with potential investors. Most programs conclude with a demo-day in which graduating founders present their startups to a large audience of investors and other agents from the ecosystem (Cohen, 2013; Cohen et al., 2019a; Dushnitsky & Sarkar, 2021).

***2.2.1*** ***Accelerators as a Source of Attraction for Women***

We assume that people who decide to engage in entrepreneurship are aware of what they need to succeed as entrepreneurs, at least to some extent, and this should be evident in the goals they set for their participation in accelerator programs. Supporting this assumption is the fact that some of the previous research that identified the various barriers for female entrepreneurship is based on qualitative interviews (e.g., xx, xx) and self reports (e.g., xx, xx), and our pilot interviews also indicated that entrepreneurs are aware of their needs. Followingly, if women and men differ in their needs, we should expect to see differences in their self-defined goals, and if accelerators’ design is suited to address these needs and resulting goals, we should expect to observe corresponding differences in the progress made during the program. For example, if we assume that women are aware of their lack in entrepreneurial experience, they are more likely than men to set gaining entrepreneurial knowledge during the program. And if accelerators provide entrepreneurial knowledge and training, women are expected to gain more in this aspect, since they are more focused on making such gains.

As noted, female novice entrepreneurs often suffer from relatively low entrepreneurial human capital. Thus, the entrepreneurial training provided by the program, might be particularly valuable and appealing for female entrepreneurs, in extending their entrepreneurial human capital. Moreover, mentorship processes within accelerators also assist in developing entrepreneurial human capital and enhancing entrepreneurial learning (St-Jean & Audet, 2012; Sullivan, 2000), and are argued to be especially valuable for founders with lower entrepreneurial human capital (Assenova, 2020; Peters et al., 2004). Thus, we expect that:

***H1a:*** *Female founders will rate improving entrepreneurial human capital as a goal for participation in accelerator higher than will male founders.* ***H1b:*** *Female founders’ progress in improving entrepreneurial human capital during the accelerator will be higher than will be that of male founders.*

The second obstacle for female founders lies in their limited and less business-oriented networks and their corresponding difficulty in acquiring informal mentoring. Accelerators provide an extensive network base to founders (Ozkazanc‐Pan & Clark Muntean, 2018) and facilitate participants’ access to the relevant community of practice (Chen, 2019). Founders are also assigned with mentors, who often open their own networks to the founders and can themselves ultimately become integrated into the founders’ networks. We therefore posit that accelerators assist female founders in expanding their business-oriented networks, and expect that:

***H2a:*** *Female founders will rate expanding their business networks as a goal for participating in an accelerator higher than will male founders.* ***H2b:*** *Female founders’ progress in expanding their business networks during the accelerator will be higher than that of male founders.*

The third obstacle for female entrepreneurs is their lower ESE and confidence. The mentorship literature suggests that a major role of mentors is providing psychosocial support (Kram, 1983), a central aspect of which is enhancing the mentee’s ESE (St-Jean & Audet, 2012; St-Jean & Mathieu, 2015). Mentors act as role models (St-Jean, 2011), which also affect founders’ self-efficacy (BarNir et al., 2011; Garaika et al., 2019; Mauer et al., 2017; Newman et al., 2019). In addition, several studies have found that entrepreneurship education and training, as accelerators provide, also contribute to the development of ESE (Cadenas et al., 2020; Cox et al., 2002; Newman et al., 2019; Shinnar et al., 2014; Zhao et al., 2005), particularly for women (Wilson et al., 2007, 2009). We therefore expect that accelerators’ mentoring and entrepreneurial training can help enhance founders’ ESE and confidence, and that this impact is more pronounced for female founders than for male founders:

***H3a:*** *Female founders will rate enhancing their ESE or confidence as a goal for participation in an accelerator higher than will male founders.* ***H3b:*** *Female founders’ increase in ESE or confidence during the accelerator will be higher than that of male founders.*

Female entrepreneurs also suffer from a legitimacy barrier (Brush et al., 2019; Murphy et al., 2007), and might increase their legitimacy by associating themselves with reputable organizations (Rao et al., 2008). Accelerators, with their intensive selection process, experienced management team and prestigious sponsors and mentors, might be seen as such reputable organizations and can thus serve as signaling entities that enhance legitimacy of female founders and their startups. Moreover, a continuous relationship with a prestigious mentors, advisors or managers can increase founder and startup legitimacy (Bangara et al., 2012; Fisher et al., 2017; McKevitt & Marshall, 2015; van Werven et al., 2015), as suggested by Bourdieu’s theory of capital (e.g., Tatli et al., 2014). McKevitt and Marshall (2015) submit that legitimacy should be regarded as the third major function of mentoring (in addition to career and psychosocial support). More specifically, finding an appropriate mentor was found to be pivotal in gaining entrepreneurial legitimacy, as mentors guide behaviors in different business contexts (which leads to legitimacy), and signal a venture’s legitimacy (Marlow & McAdam, 2015). Murphy et al. (2007) found that expert capital (e.g., interaction with experts such as mentors) has a strong positive impact on female entrepreneurs’ legitimacy and credibility. Hence, we expect that:

***H4a:*** *Female founders will rate increasing entrepreneurial legitimacy as a goal in participation in an accelerator higher than will male founders.* ***H4b:*** *Female founders’ increase in entrepreneurial legitimacy through an accelerator will be higher than that of male founders.*

Finally, a fundamental barrier to female entrepreneurship is their limited access to capital (e.g., Brush et al., 2018). Accelerators focus on this important aspect of startup development, and are increasing their impact on fundraising (Chen, 2019; IVC data 2020). During the accelerator program, founders are trained in pitching[[2]](#footnote-2) and fundraising practices, get connected with potential investors, and meet with experts to receive feedback about their readiness for investment. In addition, the program usually culminates in a demo-day, where graduating entrepreneurs pitch their startup to investors (Cohen, 2013; Hallen et al., 2020). Lastly, accelerators’ networks can provide access to capital (Elfring & Hulsink, 2003), and their positive effect on founders’ legitimacy can ease the way to raise capital (Deeds et al., 2004).

Given the importance of fundraising to new startups’ development and survival (e.g., Davila et al., 2003; Neeley & Van Auken, 2010), and the disadvantage women face in this aspect (e.g., Brush et al., 201), one might expect that fundraising will be of high priority for women joining an accelerator. While this reasoning is sound, comparing women to men, and in contrast to the other four barriers to female entrepreneurship, we expect that female founders are less likely than male founders to set fundraising as a major goal in an accelerator. Before seeking funding, entrepreneurs need to develop their entrepreneurial skills and advance their startups. If female founders join accelerators with lower entrepreneurial human capital, and if they set increasing entrepreneurial human capital as a central goal for their participation, as we suggest, it should follow that fundraising will be a lower priority for them than for male founders at this stage. Moreover, our database suggests that if female founders join accelerators with startup at earlier stages of development. Thus, their startups are less ready for investment at that point of time, suggesting that female founder will progress less in fundraising during the accelerator.

We emphasize that we do not negate the importance of fundraising for female entrepreneurs that join accelerators, and we do expect it to be high, but rather that, compared with male entrepreneurs, we expect it to be relatively less important at that point of time.

Therefore:

***H5a:*** *Female founders will rate access to capital as a goal in participation in the accelerator less than male founders.* ***H5b:*** *Female founders’ increase in ability to raise capital will be lower than that of male founders.*

**3. MATERIALS AND METHOD**

**3.1 Data and Methodology**

The study was based on our findings from a macro level dataset of 71 startup accelerators in Israel, including all active accelerators between 2011 and 2019 with at least five graduating startups as of December 2019. The dataset comprises 4,052 unique graduates and 1,842 unique startups (each startup participated in 1.45 accelerators on average), representing at least 95% of startups that graduated from accelerators in Israel during that period. During the same years, approximately 10,000 startups were created in Israel (see IVC, 2019, 2020); thus, our sample represents nearly 20% of the startups created in Israel in the relevant period. This dataset shows that the average percentage of female founders in accelerators (15.3%) is more than double than that found in the general population of startup founders (7.4%).

*Participants and procedure.*We approached 2,566 founders from the initial dataset (63% of the entire population) from 1,168 startups for whom we obtained contact details, inviting them to participate in the research. Our preference was to interview the CEO or the founder who was most involved in the accelerator. 779 founders have participated (an acceptable 30.4% response rate, 29.9% and 32.8% for men and women, respectively), representing approximately 67% of the startups in the sample (on average, a startup in our sample had 2.2 founders).

The main data of this research is based on fully-structured 45-minute interviews with female (*N* = 132, 16.9%) and male (*N* = 647, 83.1%) startup founders who had participated in accelerator programs in Israel. Trained research assistants interviewed founders through telephone conversations. The interviews addressed the accelerator program with no specific reference to gender or the goals of the current study (the interviews were part of a broader research project which does not focus on gender). We examined the goals of the founders in joining the program and their perceptions of the accelerators’ influence on their entrepreneurial human capital, networks, ESE and confidence, legitimacy, ability to raise capital, and other aspects not relevant to the current research.

**3.2 Measures**

*Pre-entry goals*. Participants were asked to report up to three main goals they had in joining the accelerator. They rated how crucial they thought each goal was for their success, on a Likert-type scale ranging from 1 (very little) to 5 (very much). Their choices were classified into fifteen pre-defined goal types[[3]](#footnote-3) (goal types that were not mentioned were coded as zero). The list was developed through a pilot phase that included sixty in-depth open interviews with accelerator managers, mentors, and founders. We use this classification to assess whether female founders are more or less likely than male founders to report goals that correspond with the five barriers for female entrepreneurship discussed above.

While participants often reported gaining entrepreneurial knowledge and skills (i.e., enhancing entrepreneurial human capital), expanding network, and raising capital among their primary pre-entry goals, they did not report enhancing confidence/self-efficacy or legitimacy as one of them (although they were mentioned in the pilot open interviews as significant goals and types of progress). Hence, we added specific questions regarding these goals in later interviews (resulting in fewer observations for these variables). We assessed the goal of increasing entrepreneurial confidence by asking, “How important was enhancing your confidence in being able to succeed as an entrepreneur as a pre-entry goal for you?” We did not assess ESE, which is often measured with multiple items (e.g., Chen et al., 1998), as a pre-entry goal. We made this choice due to practical considerations, as we did not want to overburden participants, and also because we did not expect that novice entrepreneurs can articulate exactly what specific entrepreneurial tasks and skills, they hoped to acquire (e.g., assumption validation) before they gain basic knowledge of the field. Such one-item assessments of entrepreneurial confidence have been used before (e.g., Arenius & Minniti, 2005), and have been interpreted as a proxy for self-efficacy (Tominc & Rebernik, 2007). Participants were also asked, “How important as a pre-entry goal for you was strengthening your legitimacy as an entrepreneur?” Responses for both items were rated on a Likert-type scale ranging from 1 (very little) to 5 (very high). As these were leading questions, we expected their scores to be relatively high, but this should not affect any gender differences in the ratings.

*Progress during the program*. Respondents were asked to rank their progress during the program on a Likert-type scale ranging from 1 (very little) to 5 (very high), on their pre-entry goals and on up to three other aspects. Progress aspects were classified into the same fifteen types as the pre-entry goals (progress types that were not mentioned were coded as zero). In addition, respondents were asked how significant each of these aspects were for their success. We calculated a measure that captures the amount of progress and its importance (controlling, for example, for extensive progress in an aspect that is not crucial for success), by using the square root of the progress multiplied by the importance of the aspect. Thus, this measure approximates the true value the accelerator provided to the founder for those aspects in which they feel they made the most progress during the program, and we use it to assess whether female and male founders report making progress during the program in a manner corresponding our hypotheses, regarding entrepreneurial knowledge and skills, network expansion and fundraising. Since, as we explained above, confidence, ESE and legitimacy were not spontaneously reported as pre-entry goals, we assessed the impact of the program on these aspects using specific questions.

*Accelerators’ impact on participants’ confidence and ESE*. Participants were asked to rate, on a 7-point scale ranging from -3 (decreased a lot) through 0 (did not change) to +3 (increased a lot), the change they experienced in their confidence during the program (“my confidence I can succeed as an entrepreneur”). In addition, participants reported the impact of the program on their ability to perform seven entrepreneurial tasks: assumption validation (i.e., the ability to identify necessary changes), openness to implementing changes, ability to perform changes based on these validation processes, pitching and preparing investor presentations, acquiring customers, conducting market analysis, and business and revenue model planning. Responses were rated on a 5-point scale ranging from 1 to 5. As in existing ESE scales (e.g., Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009), items represent various entrepreneurial tasks, but the items used here were chosen to reflect the Lean Startup methodology (Blank, 2013; Reis, 2011), the predominant framework of the accelerator training mindset (Mansoori et al., 2019). We averaged the seven items into a single measure, with Cronbach alpha = .87, which we interpret as an approximation of participants’ gains in ESE.

*Accelerators’ impact on participants’ legitimacy*. Participants were asked to rate six items on a 7-point scale ranging from -3 (decreased a lot) through 0 (did not change) to +3 (increased a lot), reflecting the changes they experienced following the program regarding their and their startup’s legitimacy in the eyes of venture capitalists (VCs), potential partners, and other ecosystem agents. The six ratings were combined to an aggregated measure of perceived change in legitimacy (Cronbach alpha = .85).

*Control variables*. For secondary and exploratory analyses, we used control variables to examine the residual gender effects on our outcome variables, considering those entrepreneurial human capital related variables that might account for gender differences: the founder’s level of education (obtaining an MA or higher degree prior to the program was coded as 1, otherwise, 0), entrepreneurial experience prior to the program (yes = 1, no = 0), prior accelerator participation experience (yes = 1, no = 0), and whether the founder entered the accelerator with a startup at the idea validation stage (yes = 1, no = 0) or at more advance stages. We do not have specific hypotheses regarding these regressions, but we believe that assessing the robustness of gender effect on the outcome variables might illuminate some of their causes. Descriptions of the control appear in appendix A.

*Additional background variables*. Finally, participants reported their age upon entering the program, and their educational and occupational background prior to the program. We present these variables only in the descriptive statistics.

**3.3 Data Analysis**

We first compared mean ratings of background and control variables (see Table 1) to describe the data and examine differences between women and men in the sample. To test our hypotheses, we applied mean comparisons of our dependent variables (pre-entry goals and progress) by gender. Since some of the variables are not normally distributed, we added Wilcoxon rank sum tests (WRS; see Table 3). As our hypotheses are directional, *p* values are divided by 2. While some observed gender differences might share the same source (e.g., lack of entrepreneurial experience might account for both need for entrepreneurial knowledge and network building), examining them separately is important to understand the value of accelerators, since they cannot change their past source but rather compensate for them in the present, promoting female entrepreneurship through each of them. Next, we conducted regression analyses with the control variables. These regressions can show if gender accounts for additional variance once we control for contextual and background variables. To explore our rationale that women emphasize access to capital less than men because they have higher need for basic entrepreneurial knowledge and because their startup is at a lower stage, we also examined the mediating role of both variables on fundraising as a goal and on progress in fundraising.

**3.3.1 Characteristics of Female Entrepreneurs Who Participated in Accelerators**

Table 1 presents mean comparisons of the background and control variables by gender. There are a few interesting differences between female and male founders’ backgrounds. Female founders were more educated, with 54.5% having earned at least an MA degree, compared with 41.3% for male founders. Women were more likely than men to have been educated in the life sciences (16.7% vs. 5.9%), the social sciences, or the humanities (22.7% vs. 11.7%), but less likely to have been educated in technological fields (e.g., computer, software, and engineering) (25.8% vs. 49.1%). There were no gender differences for management education.

Examining previous work experience, female founders had fewer years of entrepreneurial experience (3.5 years for women vs. 5.2 years for men), less experience in information and communication technology (ICT) domains (40.1% vs. 55.9%) and in R&D positions (33.8% vs. 50.4%), and more experience in social domains (15.2% vs. 4.6%). Regarding experience in different types of companies, female founders had less experience than male founders in startups (26.5% vs. 44.2%) and multinational corporations (25.0% vs. 34.5%), and more experience in NGOs (12.9% vs. 2.9%) and as self-employed workers (26.5% vs. 18.2%). Consequently, given their formal education and work experience, female founders were less likely to create startups in the ICT sectors (54.5% vs. 69.7%), and more likely to create a startup in the life sciences (20.5% vs. 10.0%). In addition, Table 1 shows that women tended to enter accelerator programs while their startups were at an earlier stage of development (i.e., idea validation stage) compared to their male counterparts (49.2% vs. 32.9%).

*Insert Table 1 Here*

Tables 2a, 2b and 2c present correlations between gender, goal variables, progress variables and control variables.

*Insert Tables 2a, 2b and 2c Here*

To conclude, our descriptive data corresponds with the findings in the literature suggesting that while female entrepreneurs have higher general human capital, their entrepreneurial human capital in terms of their educational field and work experience is lower than that of men. Moreover, as work experiences and education are important sources for network building (Arenius & De Clercq, 2005; Mosey & Wright, 2007; Shane, 2003), these differences also correspond with previous findings regarding business network gender differences (Brush et al., 2014).

**4. RESULTS**

Table 3 shows the results of mean comparisons of the goal and progress variables by gender.

**4.1 Entrepreneurial Human Capital**

Women rated gaining entrepreneurial knowledge and skills (i.e., increasing entrepreneurial human capital) as a pre-entry goal significantly higher than did men, *t*(777) = -3.66, *d* = -.0.349, *p*<0.001, providing support for H1a that female founders join accelerators to increase their entrepreneurial human capital more than do male founders. Women also rated their progress in increasing their entrepreneurial knowledge and skills following the program significantly higher than did men, *t*(777) = -3.67, *d* = -0.351, *p* < 0.001, providing support for H1b, that female founders make more progress in improving their entrepreneurial human capital than do male founders during the accelerator.

**4.2 Network**

Women rated expanding their networks as a pre-entry goal significantly higher than did men, *t*(777) = -2.60, *d*= -0.248, *p*=0.005, providing support for H2a that female founders join accelerators to expand their networks more than do male founders. Women also rated their progress in expanding their networks significantly higher than did men, *t*(777) = -2.94, *d* = -0.280, *p* = 0.002, providing support for H2b, that female founders progress more than male founders in expanding their networks during the accelerator.

**4.3 Entrepreneurial Confidence and Entrepreneurial Self-efficacy (ESE)**

Women rated the importance of enhancing their entrepreneurial confidence as a pre-entry goal significantly higher than did men, *t*(295) = -1.67, *d* = -0.242, *p* = 0.048, consistent with H3a that female founders join accelerators to increase their entrepreneurial confidence and ESE more than do male founders. As we do not have a full measure of enhancing ESE as a pre-entry goal, it can be considered as only partial support for H3a. In addition, women rated the impact of the program on their entrepreneurial confidence significantly higher than did men, *t*(765) = -3.46, *d* = -0.331, *p* < 0.001, and the impact of the program on their ESE significantly higher than did men, *t*(763) = -2.74, *d* = -0.266, *p* = 0.003. Together, these findings provide support for H3b, that female founders progress more than male founders in enhancing their entrepreneurial confidence and ESE in accelerators.

**4.4 Legitimacy**

Women rated enhancing legitimacy as a pre-entry goal significantly higher than did men, *t*(295) = -1.74, *d* = -0.252, *p* = 0.041, supporting H4a, that female founders join accelerators to increase their legitimacy more than do male founders. However, there were no significant differences in reported increases their legitimacy, thus failing to support H4b.

**4.5 Access to Capital**

We remind the reader that our hypotheses regarding the ability to raise capital were in the opposite direction than our previous hypotheses, due to the expected earlier stages of both women’s entrepreneurial training and their startups. Table 3 shows that women gave gaining access to capital and fundraising as a pre-entry goal significantly lower ratings than did men, *t*(777) = 1.97, *d* = 0.188, *p* = 0.025, supporting H5a. Women also reported making lower progress than men in that respect, although the effect was marginally significant, *t*(777) = 1.61, *d* = 0.154, *p* = 0.054, therefore providing partial support for H5b.

*Insert Table 3 here*

**4.6 Regression Analyses**

In Tables 4a and 4b we present the results of the regression analyses for the goal and progress variables, with gender as the independent variable and controlling for: MA degree and above, prior entrepreneurial experience, prior accelerator experience, and whether the founder entered the accelerator with a startup at the idea validation stage. These regressions can show whether gender accounts for additional variance once we control for these variables.

We note that these analyses neither undermine nor strengthen our initial hypotheses, as we make no claim that the predicted gender differences are, or are not, caused exclusively by either gender or by associated background conditions. While the mean comparisons described above examine the different needs and resulting progress of female and male entrepreneurs in accelerators, these regressions provide some information regarding the sources of these differences.

Overall, gender had a significant residual effect in predicting gaining entrepreneurial knowledge and skills (entrepreneurial human capital), both as a pre-entry goal and as an aspect of progress. Gender effect remained significant also for both indicators of networks expansion, and for progress in entrepreneurial confidence and self-efficacy. For all other outcomes, gender did not explain additional variance in the regressions. Thus, the aggregate gender differences in these outcomes can be explained by gender differences in the background conditions (control variables).

Entering the program with a venture at the idea validation stage was a strong predictor for most outcomes (excluding network goal and progress). Managing a relatively young startup may indicate fewer prior opportunities for gaining entrepreneurial knowledge, building one’s confidence and establishing the founder’s credibility and legitimacy, thus explaining the positive significant coefficient. On the other hand, managing a startup at a more mature stage increases the relevance of gaining access to capital and progressing in the fundraising quest. This is expressed in the negative associations between a startup being at the idea validation stage and the access to capital indicators. Finally, obtaining an MA degree or above, prior entrepreneurial experience, and prior participation in accelerators, provide opportunities for gaining entrepreneurial and managerial knowledge, which is expressed in their negative associations with the two indicators of gaining entrepreneurial knowledge.

Finally, our rationale for expecting that women will place lower priority than men on fundraising (5Ha) and will progress less in fundraising (H5b), was based on the assumption that women need more basic training, relative to men (H1a), which should precede targeting fundraising on the assumption women enter accelerators with startup in earlier stages of development. To examine this rationale, we added a second regression for each variable (fundraising as a goal and as an aspect of progress – see models 6 and 14), adding the goal of acquiring entrepreneurial knowledge as a control (the idea stage dummy was already a control variable). If our rationale is correct, we can expect entrepreneurial knowledge and being at the idea stage to attenuate gender effects on these variables. Lastly, a mediation effect analysis of the goal of gaining entrepreneurial knowledge and of startup stage on fundraising is conducted (see model 7 and 15) to support our argument that gender differences in access to capital as goal and progress are caused by these background variables, at least in part.

Adding the goal of gaining entrepreneurial knowledge and the idea stage dummy as controls for the regressions predicting fundraising (as both goal and progress) attenuated the effect of gender, supporting our premise that in part, women will be less likely to target fundraising and will progress less in this regard, due to their higher need in entrepreneurial knowledge and earlier stage of startup development. As further support for our arguments, the goal of gaining entrepreneurial knowledge and the idea stage dummy both mediated the association between gender and the two indicators of fundraising.

**5. DISCUSSION AND CONCLUSIONS**

**5.1 Discussion**

Our study was driven by an initial finding that female founders’ participation rates in Israeli accelerators are significantly higher (15.3%) than their participation rate in Israel’s general startup sector (7.4%). This finding motivated us to examine the potential role of accelerators in enhancing female entrepreneurship by addressing the specific needs of female startup founders. In linking the design of accelerator programs to the general barriers to female entrepreneurship, our results provide important evidence regarding what female founders aim to achieve by entering an accelerator program, and the value accelerators eventually provide them.

We present evidence that female founders seek more and gain more entrepreneurial training during their participation in accelerators than do male founders (*t*(777) = -3.66, *p* < 0.001; *t*(777) = -3.67, *p* < 0.001, respectively); place more emphasis on and succeed more in strengthening their networks (*t*(777) = -2.60, *p* = 0.005; *t*(777) = -2.94, *p* = 0.002, respectively); place more emphasis on enhancing their entrepreneurial confidence (*t*(295) = -1.67, *p* = 0.048) and increase more in their confidence (*t*(765) = -3.46, *p* < 0.001) and ESE (*t*(763) = -2.74, *p* = 0.003).

With regard to ESE, a recent finding by Gielnik et al. (2020) suggests that above a certain point, high levels of ESE might lead to over-confidence, thereby having a negative impact on entrepreneurship. In our sample, however, increases in ESE following the program were not associated with the founder’s belief in their startup’s future success (*r* = .04, *p* = .59), indicating that the increase in ESE had unlikely reached the point of over-confidence.

While female founders put more emphasis on increasing their legitimacy, they did not report more progress than did male founders in this aspect (though they did report making significantly higher progress than the neutral 0, *t*(83) = 10.88, *p* < 0.001). This finding suggest that female founders' legitimation barriers are mostly caused by discrimination rather on lacking assets and skills, and thus addressing female founders' legitimation barriers require a deeper cultural change rather than better supporting systems.

These findings are consistent with known barriers to female entrepreneurship and highlight the potential value accelerators provide in addressing these barriers. They also suggest that accelerators that specifically target early-stage startups and provide more early-stage training (such as academic accelerators), might be especially valuable for female entrepreneurs. Supporting such accelerators might be an effective policy in the current efforts to advance the scale and impact of women-owned businesses. Moreover, this might suggest that some female founders should better begin with a pre-accelerator to level their entrepreneurial human capital and stage of development, before they join an accelerator. Doing so might prepare them advance more in access to capital during the accelerator. The fact that the pre-entry goals of female founders correspond with their hypothesized needs (derived from the known barriers for female entrepreneurship), is important for another reason, as it supports our initial underlying assumption that women who decide to launch an entrepreneurial career are aware of their barriers.

In addition, both the initial goal of and progress in obtaining access to capital received lower ratings from female founders, as we hypothesized (though their progress ratings was significantly higher than the neutral 0, *t*(131) = 9.20, *p* < 0.001). We attribute this to the fact that access to capital and fundraising becomes more feasible once a startup has matured beyond the idea validation stage, and that acquiring basic entrepreneurial training precedes improving fundraising skills or opportunities. We further discuss the implications of this finding in the limitations section.

Finally, controlling for background variables attenuated the effect of gender on some of the outcome variables (confidence/ESE, legitimacy, and access to capital). This attenuation indicates that for these outcomes, gender has an indirect effect. The effect of gender on gaining entrepreneurial knowledge and skills and expanding networks remains robust. This does not necessarily indicate inherent gender differences, rather, these outcomes might be accounted for by unobserved variables, for example, the quality of a founder’s network prior to entering the accelerator. In any case, even when gender effects are attenuated, this does not undermine the main conclusion that accelerators are designed in a way that caters for female entrepreneurs’ needs, regardless of their origins, and can thus support their integration in the entrepreneurial eco-system.

According to the liberal feminist theory (Calás et al., 1999; Phillips, 1987), women and men are effectively similar and equally able (Ahl, 2006). As such, observed differences in entrepreneurial tendency, actions, and performance are grounded in discrimination, gendered socialization, and unequal access to essential resources and experiences, such as education, relevant work experience, networks, role models and mentors (Ahl, 2006; Boden and Nucci, 2000; Greene et al., 2001; Fischer et al., 1993). The liberal feminist outlook would suggest that accelerators promote women entrepreneurs not because of their gender, but due to their typical background conditions. According to this viewpoint, women-friendly accelerators (e.g., accelerators that accept and treat female and male founders equally) would be most suitable for women. Drawing on this perspective, some of our conclusions could also be applicable to male founders who start their entrepreneurial career with similar disadvantages, and, perhaps more importantly, to founders from underrepresented populations in general.

In contrast, the radical feminist theory (Calás et al., 1999; Rowland, & Klein, 1996) posits that there are inherent differences between women and men that are not fully explained by external factors (Ahl, 2006). Accordingly, regardless of background conditions, women might require different support, design elements, and processes than would men, as they are affected differently by ecosystem factors (Elam et al., 2019). The radical feminist outlook suggests that scholars, as well as decision makers, should consider these inherent differences, and the resulting gender-specific needs, when seeking to promote female entrepreneurship. This outlook might stress the importance of specifically designing accelerators for women bearing in mind these inherent differences. This question is relevant to the current debate of the advantages and disadvantages of women-focused accelerators, compared to women-friendly accelerators (Brush & Elam, 2021). Our data cannot fully resolve this dispute, but it might be useful in suggesting viable directions for future research on this topic.

* 1. **Limitations**

Some limitations should be noted in interpreting our results. First, a large part of the data might be biased because it was self-reported by the founders. For example, gender differences in social desirability may have led women to provide inflated ratings (e.g., Dalton & Ortegren, 2011). However, out of 15 pre-entry goals and progresses in our data, seven did not yield significant gender differences. When gender differences were observed, they were mostly consistent with our hypotheses, and those differences for which we had no hypotheses were split between women (two goals and two progresses) and men (one goal and two progresses). Moreover, the fact that some gender effects were not significant after controlling for background variables should also address the concern that the results might suffer from gender response bias.

Second, although we have shown that female participation rates were significantly higher in accelerators than in the general entrepreneurial population, some arguments can be raised against our interpretation that this is specifically because accelerators provide the kind of help that female founders need. Women tend to seek help more than do men in different contexts (Bamberger, 2009), and this tendency might cause them to seek the help of accelerators regardless of the specific type of help they provide. Additionally, we do not have data about applications to accelerators by gender, so the relative increase in women’s rates in accelerators might simply be due to gendered acceptance rates rather than gendered application rates. However, both alternative explanations for the higher proportion of women in accelerators do not negate either our premise that accelerators’ design caters to the specific needs of female entrepreneurs, nor our findings that female founders require and advance more than men on most of these aspects. It should be emphasized that the observed high proportion of women in accelerators merely triggered our research, but it does not account for none of the empirical results and conclusions.

Third, our data suggests that women advance less than men in their access to capital and in fundraising. Though this finding is consistent with our predictions and with previous findings (Chen, 2019; Dutt & Kaplan, 2020), it may seem to undermine our suggestion that accelerators promote female founders more than male founders (although female founders do advance on this aspect as well), considering the centrality of access to capital for entrepreneurial success (Brush et al., 2018). If accelerators do not ultimately reduce the gender gap in fundraising, that would indicate a serious flaw in our argument that accelerators can help close the entrepreneurial gender gap. However, we believe that there are some factors that counter such concern. We posit that the finding that women advance less in access to capital is, at least partly, the product of the first barrier (entrepreneurial human capital) and due to the stage of their startups. Relative to men, women require more entrepreneurial training, and their startups tend to be at earlier stages of development when they enter an accelerator. Consequently, an accelerator’s effect on actual fundraising of female founders should only be clear in the long run, following an increase in entrepreneurial human capital and the maturation of the startup. As our data cannot show this long-term effect, this suggestion could be examined in future research.

Nonetheless, our data provide some evidence to support our premise. First, the startups of female founders in our sample tended to be at a more preliminary stage (i.e., idea validation) than those of male founders (*r* = -0.13, *p* < 0.001). If a venture is at a more preliminary stage, and its founder is still building their basic entrepreneurial skills, it follows that fundraising will be of lower priority. Targeting access to capital as a goal negatively correlated with both a startup being at the idea validation stage (*r* = -0.15, *p* < 0.001) and with targeting entrepreneurial human capital (*r* = -0.21, *p* < 0.001). Second, our regression (models 5, 6, 13 and 14) did not indicate that gender has a unique effect on fundraising, both as a pre-entry goal and as an aspect of progress, but rather an indirect effect through the goal of gaining entrepreneurial human capital and startup stage (models 7 and 15). This suggests that gender differences in access to capital are caused by background conditions rather than by gender per se, which is consistent with Elam et al.’s (2019) suggestion that women’s limited access to capital might be a symptom of other factors (e.g., the barriers we described). Together, these results support the argument that in the long run, accelerators probably advance female founders in access to capital as much as they advance male founders. Our findings suggest that targeting short-term effects on fundraising, as was done in previous research, likely misses much of the value accelerators provide to women.

Fourth, our research was conducted in the Israeli entrepreneurial ecosystem. There may be some concerns regarding the generalizability of our findings to other entrepreneurial ecosystems. However, Israel is a leading and internationally connected entrepreneurial ecosystem (Compass, 2019), and the barriers female entrepreneurs around the world face are similar to those faced by Israeli female entrepreneurs. Thus, it is highly probable that accelerators in other ecosystems similarly address these barriers and have similar impact on female founders.

* 1. **Conclusions**

Women are substantially underrepresented in entrepreneurship in high-growth sectors (Brush et al., 2014; Morris et al., 2006; Langowitz & Minniti, 2007; Robb et al., 2014). Increasing their participation rate in entrepreneurial ventures has important consequences for economic growth, financial independence, equality, and innovation (Hechavarría et al., 2019; Kelley et al., 2017). This study addressed this issue by focusing on the role of startup accelerators (where female participation is noticeably higher than in the startup ecosystem) in supporting female entrepreneurship. We described five barriers for female entrepreneurship identified in the literature: low entrepreneurial human capital, limited networks, low ESE and confidence; low legitimacy in the entrepreneurial ecosystem; and limited access to capital. We suggest that minimizing these barriers should decrease the gender participation gap in entrepreneurship. We examined our premises within the Israeli entrepreneurial ecosystem, which is among the world’s leading and influential entrepreneurial ecosystems (Compass, 2019).

We examined the specific types of support that accelerators provide: entrepreneurial training, network extension, intensive mentoring, legitimation signaling entity, and fundraising support and training, in the context of the five barriers to female entrepreneurship, and suggested that accelerators address these barriers independently and simultaneously. With regard to the first three barriers mentioned, the impact of accelerators on female founders was stronger than on male founders. The impact remained positive for female founders for the other two barriers as well (but not higher than for male founders). We conclude that accelerators have the potential to act as powerful catalysts for women’s successful integration into the entrepreneurial ecosystem and in reducing the gender gap in entrepreneurship.

* 1. **Future Research**

This study suggests that accelerators may increase women’s participation in entrepreneurial ventures and presents initial evidence regarding the value that accelerators provide to female founders. Additional lines of research should extend our findings in five directions. First, future research should use measures other than self-reporting, such as objective data or ratings of program managers and mentors. Second, it is advisable to use objective and long-term performance measures (including fundraising measures) in a longitudinal design, to support the premise that accelerators not only encourage female participation in entrepreneurship, but also promote their ultimate success. Third, evidence should be collected from different entrepreneurial ecosystems, to increase the external validity of our findings. Fourth, our hypotheses should be tested in different types of accelerators to understand and appreciate to what extent our results might be generalized to the entire class of accelerators or are rather limited to specific types of accelerators. Examining different types of accelerators, with different design and goals, will gain better insights on the specific elements that are most crucial for enhancing female entrepreneurship and will strengthen our policy implication. Fifth, more research should focus on the role of and differences between women-dedicated and women-friendly accelerators and pre-accelerators in promoting female entrepreneurship and decreasing the gender gap in entrepreneurship.

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**Table 1:** *Background and control variables: t-tests (female=1, male=0)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Female** | | **Male** | |  |
| **Variable** | **Mean (SD)** | **N** | **Mean (SD)** | **N** | **t value** |
| **Founder Age** | 36.4 (8.48) | 132 | 38.2 (10.1) | 647 | 1.88† |
| **A. Education** (%) | | | | | |
| **MA degree** | 54.5 (50.0) | 132 | 41.3 (49.3) | 647 | -2.82\*\* |
| **Technology** | 25.8 (49.3) | 132 | 49.1 (50.0) | 647 | 4.99\*\*\* |
| **Management** | 32.6 (47.0) | 132 | 36.9 (48.3) | 647 | .950 |
| **Life Sciences** | 16.7 (37.4) | 132 | 5.9 (23.5) | 647 | -4.28\*\*\* |
| **Humanities & Social** | 22.7 (48.3) | 132 | 11.7 (31.9) | 647 | -3.37\*\*\* |
| **B. Accelerator Pre-Entry Work Experience (%)** | | | | | |
| **R&D** | 31.8 (46.8) | 132 | 50.4 (50.0) | 647 | 3.93\*\*\* |
| **ICT** | 40.1 (49.2) | 132 | 55.9 (49.7) | 647 | 3.34\*\* |
| **Social domain** | 15.2 (36.0) | 132 | 4.6 (21.0) | 647 | -4.55\*\*\* |
| **Entrepreneurial exp.** | 75.0 (43.5) | 132 | 73.9 (44.0) | 647 | -.267 |
| **Self employed** | 26.5 (44.3) | 132 | 18.2 (38.6) | 647 | -2.19\* |
| **Startup experience** | 26.5 (44.3) | 132 | 44.2 (49.7) | 647 | 3.79\*\*\* |
| **MNC** | 25.0 (43.5) | 132 | 34.5 (47.6) | 647 | 2.11\* |
| **NGO** | 12.9 (33.6) | 132 | 2.9 (16.9) | 647 | -5.03\*\*\* |
| **Previous accelerator** | 19.7 (39.9) | 132 | 20.1 (40.1) | 647 | .103 |
| **C. Startup Characteristics at Entry (%)** | | | | | |
| **Sector ICT** | 54.5 (50.0) | 132 | 69.7 (46.0) | 647 | 3.40\*\*\* |
| **Sector Life Sciences** | 20.5 (40.5) | 132 | 10.0 (30.1) | 647 | -3.40\*\*\* |
| **Stage: Idea** | 49.2 (40.6) | 132 | 32.9 (29.3) | 647 | -3.59\*\*\* |
| **Stage: PMF** | 31.1 (46.5) | 132 | 39.3 (48.9) | 647 | 1.77 |
| **Stage: Scale** | 19.7 (39.9) | 132 | 27.7 (44.8) | 647 | 1.90† |

Notes: \*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

Table 2a: *PW Correlation Matrix – goals and control variables*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | Female | (1) | (2) | (3) | (4) | (5) |
| (1) Knowledge | .13\*\*\* | 1.00 |  |  |  |  |
| (2) Network | .09\*\* | .03 | 1.00 |  |  |  |
| (3) Confidence | .10† | .23\*\*\* | .11† | 1.00 |  |  |
| (4) Legitimacy | .10† | .11† | .16\*\* | .69\*\*\* | 1.00 |  |
| (5) Fundraising | -.07\* | -21\*\*\* | -.07† | -.01 | .04 | 1.00 |
| Founder age | -.07† | -.09\* | -.03 | -.09 | -.11† | .03 |
| Prev. accelerator | -.01 | -.20\*\*\* | .05 | -.10† | -.09 | .06 |
| MA degree | .10\*\* | -.11\*\* | -.03 | -.02 | -.08 | -.01 |
| Entrep. exp. | .01 | -.07\* | -.10\*\* | -.12\* | -.10† | -.06† |
| Idea: stage | .13\*\*\* | .25\*\*\* | .05 | .24\*\*\* | .21\*\*\* | -.15\*\*\* |

Notes: \*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

Table 2b: *PW Correlation Matrix –areas of progress and control variables*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | Female | (1) | (2) | (3) | (4) | (5) | (6) |
| (1) Knowledge | .13\*\*\* | 1.00 |  |  |  |  |  |
| (2) Network | .10\*\* | .09\*\* | 1.00 |  |  |  |  |
| (3) Confidence | .12\*\*\* | .18\*\*\* | .08\* | 1.00 |  |  |  |
| (4) ESE | .10\*\* | .21\*\*\* | .10\*\* | .37\*\*\* | 1.00 |  |  |
| (5) Legitimacy | -.01 | .13\*\* | .01 | .44\*\*\* | .36\*\*\* | 1.00 |  |
| (6) Fundraising | -.06 | -.15\*\*\* | .01 | .04 | -.04 | .05 | 1.00 |
| Founder age | -.07† | -.06† | -.02 | -.17\*\*\* | -.08\* | -.07 | -.03 |
| Prev. accelerator | -.004 | -.20\*\*\* | -.008 | -.04 | -.10† | -.02 | .05 |
| MA | .10\*\* | -.09\* | -.02 | -.09\* | -.07† | -.07 | -.02 |
| Entrepreneurial exp. | .01 | -.09\* | -.09\* | -.08\* | >.01 | .03 | -.04 |
| Idea: stage | .13\*\*\* | .27\*\*\* | .04 | .12\*\*\* | .21\*\*\* | .10\* | -.14\*\*\* |

Notes: \*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

Table 2c: *PW Correlation Matrix – control variables*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | (1) | (2) | (3) | (4) | (5) | (6) |
| (1) Female | 1.00 |  |  |  |  |  |
| (2) Founder age | -.07† | 1.00 |  |  |  |  |
| (3) Previous accelerator | -.004 | -11\*\* | 1.00 |  |  |  |
| (4) MA | .10\*\* | .21\*\*\* | .03 | 1.00 |  |  |
| (5) Entrepreneurial exp. | .01 | .08\* | .02 | .06† | 1.00 |  |
| (6) Idea: stage | .13\*\*\* | -.10\*\* | -.23\*\*\* | -.01 | -.02 | 1.00 |

Notes: \*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

**Table 3:** *Goals and progress: t-tests and Wilcoxon rank sum tests (female=1, male=0)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Female Mean (SD)** | **N Female** | **Male Mean (SD)** | **N**  **Male** | **T** | **ES**  **Cohen’s d** | **WRS (Pr)** |
| **A. Founder’s Pre-entry Goals Critical Level (scale 0-5; Confidence and Legitimacy scale: 1-5)** | | | | | | | |
| **Knowledge** | 1.71 (2.21) | 132 | 1.05 (1.81) | 647 | -3.66\*\*\* | -.349 | <.001 |
| **Network** | 1.58 (2.12) | 132 | 1.12 (1.79) | 647 | -2.60\*\* | -.248 | .001 |
| **Confidence** | 2.93 (1.54) | 60 | 2.57 (1.52) | 237 | -1.67\* | -.242 | .050 |
| **Legitimacy** | 2.82 (1.63) | 60 | 2.43 (1.53) | 237 | -1.74\* | -.252 | .042 |
| **Fundraising** | 1.66 (2.07) | 647 | 2.08 (2.22) | 132 | 1.97\* | .188 | .001 |
| **B. Founders’ Progress Level (scale 0-5; confidence and Legitimacy scale: -3 to +3) during the accelerator** | | | | | | | |
| **Knowledge** | 1.88 (1.50) | 132 | 1.20 (1.06) | 647 | -3.67\*\*\* | -.351 | <.001 |
| **Network** | 1.90 (2.14) | 132 | 1.36 (1.86) | 647 | -2.94\*\* | -.280 | .002 |
| **Confidence** | 1.79 (1.26) | 132 | 1.34 (1.35) | 635 | -3.46\*\*\* | -.331 | <.001 |
| **ESE** | 3.04 (0.96) | 129 | 2.78 (1.00) | 623 | -2.74\*\* | -.266 | .012 |
| **Legitimacy** | 1.24 (1.04) | 84 | 1.27 (0.96) | 368 | .316 | .038 | .845 |
| **Fundraising** | 1.48 (1.84) | 132 | 1.77 (1.89) | 647 | 1.61† | .154 | .059 |

Notes: \*\*\* p < .001; \*\* p < .01; \* p < .05, † p <.1

We have directional hypotheses thus we display one-sided p-values

Sample size for entrepreneurial confidence and legitimacy variables are smaller since these questions were added after data collection was already in progress.

**Table 4a:** *OLS Regressions - Dependent variables: Founders’ goals prior to entry*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| DV | EHC\_Goal | Net\_Goal | ESC\_Goal | Legit\_Goal | Raise\_Goal | Raise\_Goal | Raise\_Goal |
| Female | .582\*\*  (.151) | .443\*  (.178) | .305  (.218) | .364  (.224) | -.308  (.210) | -.182  (.209) | -.182  (.208) |
| MA | -.404\*\*  (.131) | -.114  (.134) | .040  (.181) | -.172  (.186) | -.002  (.158) | -.085  (.157) | -.085  (.156) |
| Entrep. exp. | -.263†  (.147) | -.405\*\*  (.151) | -.299  (.196) | -.245  (.201) | -.316†  (.178) | -.373\*  (.176) | -.373\*  (.175) |
| Prev. accelerator | -.700\*\*\*  (.165) | .330†  (.169) | -.285  (.274) | -.272  (.281) | .148  (.200) | .002  (.199) | .002  (.198) |
| Stage: idea | .786\*\*\*  (.139) | .223  (.143) | .647\*\*\*  (.179) | .550\*\*  (.184) | -.618\*\*\*  (.169) | -.448\*\*  (.169) | -.448\*\*  (.169) |
| Confidence Goal | - | - | - | - | - | -.216\*\*\*  (.043) | -.216\*\*\*  (.043) |
| Female  (->Stage) |  |  |  |  |  |  | -.072\*  (.034) |
| Female  (->Knowledge) |  |  |  |  |  |  | -.142\*\*  (.048) |
| Constant | 1.26\*\*\*  (.151) | 1.33\*\*\*  (.155) | 2.49\*\*\*  (.213) | 2.43\*\*\*  (.219) | 2.48\*\*\*  (.183) | 2.76\*\*\*  (.189) |  |
| F-value | 19.02 | 4.03 | 4.72 | 3.92 | 4.59 | 8.16 |  |
| p-value | .0000 | .0013 | .0004 | .0019 | .0004 | .0000 |  |
| R2 (adj.) | .1038 | .0191 | .0591 | .0470 | .0226 | .0523 |  |
| N | 779 | 779 | 297 | 297 | 779 | 779 |  |

Standard errors are reported in parentheses.

\*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

**Table 4b:** *OLS Regressions - Dependent variables: Founders’ progresses*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| DV | EHC\_P | Net\_P | ESC\_P | ESE\_P | Legit\_P | Raise\_P | Raise\_P | Raise\_P |
| Female | .577\*\*\*  (.178) | .530\*\*  (.185) | .438\*\*\*  (.129) | .223\*  (.097) | -.057  (.119) | -.192  (.181) | -.105  (.180) | -.105  (.179) |
| MA | -.338\*  (.134) | -.086  (.139) | -.272\*\*  (.098) | -.159\*  (.073) | -.133  (.094) | -.065  (.136) | -.125  (.135) | -.125  (.135) |
| Entrep. exp. | -.357\*  (.151) | -.371\*  (.156) | -.219\*  (.110) | .033  (.083) | .105  (.108) | -.189  (.152) | -.228  (.152) | -.228  (.151) |
| Prev. accelerator | -.688\*\*\*  (.169) | .087  (.176) | -.027  (.123) | -.143  (.094) | -.013  (.131) | .109  (.172) | -.006  (.172) | -.006  (.171) |
| Stage: idea | .907\*\*\*  (.143) | .135  (.148) | .296\*\*  (.103) | .393\*\*\*  (.086) | .191\*  (.096) | -.529\*\*\*  (.145) | -.412\*\*  (.146) | -.412\*\*  (.146) |
| Knowledge Goal | - | - | - | - | - | - | -.148\*\*\*  (.037) | -.148\*\*\*  (.037) |
| Female  (->Stage) | - | - | - | - | - | - | - | -.067\*  (.030) |
| Female  (->Knowledge) | - | - | - | - | - | - | - | -.097\*\*  (.036) |
| Constant | 1.44\*\*\*  (.155) | 1.61\*\*\*  (.161) | 1.52\*\*\*  (.113) | 2.71\*\*\*  (.086) | 1.17\*\*\*  (.112) | 2.08\*\*\*  (.157) | 2.28\*\*\*  (.163) | 2.28\*\*\*  (.163) |
| F-value | 20.63 | 3.17 | 6.90 | 9.36 | 1.45 | 3.98 | 6.05 |  |
| p-value | .0000 | .0076 | .0000 | .0000 | .2045 | .0014 | .0000 | .0000 |
| R2 (adj.) | .1120 | .0201 | .0371 | .0527 | .0050 | .0188 | .0375 | .0421 |
| N | 779 | 779 | 767 | 752 | 452 | 779 | 779 | 779 |

Standard errors are reported in parentheses.

\*\*\* p < .001; \*\* p < .01; \* p < .05, † p<.1

**Appendix A**

Table A1: *Description of goals and progress variables*

|  |  |
| --- | --- |
| Knowledge Goal | How critical was the goal of gaining entrepreneurial knowledge (in a scale of 1-5) and 0 if it was not a goal |
| Network Goal | How critical was the goal of expanding networks (in a scale of 1-5) and 0 if it was not a goal |
| Confidence Goal | How critical was the goal of enhancing entrepreneurial confidence in a scale of 1-5 (this was a direct question; thus, it was always mentioned – no 0) |
| Legitimacy Goal | How critical was the goal of enhancing entrepreneurial legitimacy in a scale of 1-5 (this was a direct question; thus, it was always mentioned – no 0) |
| Fundraising Goal | How critical was the goal of gaining access to capital (in a scale of 1-5) and 0 if it was not a goal |
| Knowledge Progress | Progress level in entrepreneurial knowledge and skills during the accelerator program (on a scale of 0-5) |
| Network Progress | Progress level in expanding networks during the accelerator program (on a scale of 0-5) |
| Confidence Progress | Level of change in entrepreneurial confidence during the accelerator program (on a scale of -3 to +3) |
| ESE Progress | Level of change in entrepreneurial self-efficacy during the accelerator program (on a scale of 1 to 5) |
| Legitimacy Progress | Level of change in entrepreneurial legitimacy during the accelerator program (on a scale of -3 to +3) |
| Fundraising Progress | Progress level in access to capital during the accelerator program (on a scale of 0-5) |

\* The 15 pre-entry goals and progress variables that we collected included: 1) Gaining entrepreneurial knowledge and skills, 2) Expanding networks, 3) Enhancing ESC/ESE and 4) Gaining legitimacy, 5) Access to capital, 6) Sales and marketing, 7) Validation processes, 8) Product development, 9) Improving the pitching and presentation skills, 10) Business development, 11) Advancing the business plan, 12) Team building, 13) Personal development, 14) Gaining exposure, 15) Joining an entrepreneurial community.

Table A2: *Description of background and control variables*

|  |  |
| --- | --- |
| **Variable name** | **Variable description** |
| Female | 1 for female founder and 0 for male founder |
| Founder Age | Founder’s age when entered the accelerator |
| MA degree | 1 if the founder has at least a second degree, otherwise 0 |
| Edu: Technology | 1 if the founder has a technology degree, otherwise 0 |
| Edu: Management | 1 if the founder has a degree in management, otherwise 0 |
| Edu: Life science | 1 if the founder has a degree in the life science, otherwise 0 |
| Edu: Humanities & Social | 1 if the founder has a degree in the humanities or social sciences, otherwise 0 |
| R&D | 1 if the founder has work experience in an R&D position, otherwise 0 |
| ICT domain | 1 if the founder worked in a firm in the ICT domain, otherwise 0 |
| Social domain | 1 if the founder worked in a firm in the social/impact domain, otherwise 0 |
| Entrep. exp. | 1 if the Founder has experience as an entrepreneur prior to the current startup, otherwise 0 |
| Self exp. | 1 if the founder has been self-employed, otherwise 0 |
| Startup exp. | 1 if the founder has work experience in a startup, otherwise 0 |
| MNC exp. | 1 if the founder has work experience in a multinational corporation, otherwise 0 |
| NGO exp. | 1 if the founder has work experience in an NGO, otherwise 0 |
| Prev. accelerator | 1 if the founder has participated in an accelerator before the one interviewed about, otherwise 0 |
| Sector ICT | 1 if the startup is in the ICT domain, otherwise 0 |
| Sector LS | 1 if the startup is in the life sciences domain, otherwise 0 |
| Stage: Idea | 1 if the startup is in the idea validation stage (prior to PSF), otherwise 0 |
| Stage: PMF | 1 if the startup is in the product validation stage (between PSF and PMF), otherwise 0 |
| Stage: Scale | 1 if the startup is in the scaleup stage (after PMF), otherwise 0 |

1. https://pitchbook.com/news/articles/one-third-of-us-startups-that-raised-a-series-a-in-2015-went-through-an-accelerator [↑](#footnote-ref-1)
2. Pitching skills are important for attracting investors’ initial interest (Balachandra et al., 2019). [↑](#footnote-ref-2)
3. The 15 pre-entry goals and progress variables that we collected included: 1) Gaining entrepreneurial knowledge and skills; 2) Expanding networks; 3) Enhancing entrepreneurial confidence/ESE; 4) Gaining legitimacy; 5) Fundraising; 6) Sales and marketing; 7) Validation processes; 8) Product development; 9) Improving pitching and presentation skills; 10) Business development; 11) Advancing the business plan; 12) Team building; 13) Personal development; 14) Gaining exposure; and, 15) Joining an entrepreneurial community. [↑](#footnote-ref-3)