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DISCUSSION PAPER SERIES

IZA DP No. 17275

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ABSTRACT

Reducing the Gender Digital Divide Amongst Immigrant Entrepreneurs

Information and communication technology (ICT) can boost existing socio-economic inequalities if the former is socially exclusive. Longstanding barriers prevent minoritized populations from accessing ICT, thus leading to a vicious circle between digital divide and poor development. The digital divide can be most important when assessing United Nations (UN) sustainable development goals No. 4 (lifelong learning opportunities), No. 5 (empowerment), No. 8 (growth), and No. 10 (reduced inequalities). The current study presents the outcomes of a business apps training intervention, targeting immigrant entrepreneurs running small firms in Greece, Cyprus and the UK. Multifaceted gender digital divides were unravelled, and training was found to improve entrepreneurs' internet/digital skills and firms' digital competencies, whilst also boosting empowerment and reducing gender digital disparities. Given the positive contribution of immigrant firms to countries' growth, ways to facilitate sustainable performances through digital skills training merit consideration. Further, improving immigrant female entrepreneurs' digital skills requires intersectional approaches that address a vector of socio-economic and cultural barriers, ensuring that ICT-driven sustainable development is much more inclusive.

JEL Classification: O3, M2

Keywords: information and communication technology, digital divide, immigrants, business apps training, empowerment, digital competencies

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1. Introduction

Information communications technology (ICT) is a significant enabler of small firm operations and performance because it facilitates improved access to information and task efficiencies, resulting in competitiveness, growth and survival (Drydakis, 2022a; b; Orser et al., 2019). However, the gender of firm ownership is a factor in the technology adoption processes (Orser et al., 2019). Digital divide is defined as the gap between individuals, households, firms and geographic areas at different socio-economic levels with regard both to the opportunities to access ICT and to the use of the internet for a wide variety of activities, including entrepreneurship (OECD, 2017; 2001).

The digital divide can take many forms and be described in terms of gender, ethnicity, region, skills and income (Acilar and Sæbø, 2023). Surveys indicate that one of the most significant gender issues is related to ICT access and use (Acilar and Sæbø, 2023). The gender digital divide refers to the unequal level of access, opportunities, use and development of ICT skills between genders (Gurung, 2018). Sustainable development and gender equality are difficult goals to achieve if there is no overall participation from women in the emerging world of ICT (Gurung, 2018). Information literacy has an important impact on the level of sustainable development of a country (Hidalgo et al., 2020). The use of ICT can allow for the implementation of new, more effective educational techniques, thus leading to increased information literacy of individuals and subsequently facilitating UN sustainable development goals No. 4 (related to lifelong learning opportunities), No. 5 (related to empowerment), No. 8 (related to growth) and No. 10 (related to reduced inequalities) (Hidalgo et al., 2020).

In 2021, in the EU more men than women had at least basic digital skills (56% versus 52%, respectively) (European Commission, 2022). Moreover, in 2022, in the EU only one in five ICT specialists and ICT graduates were women (European Commission, 2022). The determinants of the gender digital divide range from gender inequality regarding the access to resources and opportunities, to cultural expectations and gender roles, and to institutional inefficiencies when it comes to reducing inequalities (Acilar and Sæbø, 2023). If technology, and innovation in general, is socially exclusive, it can increase existing socio-economic inequalities (Fragkandreas, 2022; Cheng et al., 2019; Juhn et al., 2014; Acemoglu and Autor, 2011). If wealthier households, better educated people and men can more easily adopt innovation's outcomes, then skill premiums can potentially increase (Acemoglu and Autor, 2011). Technology can replace those who are no longer needed or cannot follow the new technology-driven production model (Frey and Osborne, 2017; Acemoglu

and Autor, 2011; Archibugi and Lundvall, 2001). Hence, technology can result in increased income inequality through increased skill premiums and unemployment (Fragkandreas, 2022; Aghion et al., 2019; Frey and Osborne, 2017; Goos, 2018).

Studies have evaluated how technology is gendered (Faulkner, 2001). Social norms and context can influence awareness of, access to, and adoption of ICT (Orser et al., 2019). If cultural images of technology are associated with masculinity, then technology is being gendered, and this subsequently affects technical knowledge and gender division of labour around technology (Faulkner, 2001). Similarly, if technical practice is being gendered and technological artifacts are being gendered materially and symbolically, then the digital divide appears (Faulkner, 2001). It is indicated that the design, technical content and use of artifacts are influenced by the marginalization of women when it comes to technological progress, education and community (Wajcman, 2010). This pattern indicates that technology can be both a source and cause of digital divide (Wajcman, 2010). Indeed, the literature indicates that most technology and innovation interventions are gender-blind, and thus accentuate the activities of men, often unconsciously excluding women entrepreneurs (Orser et al., 2019; Kvidal and Ljunggren, 2014). As a result, gender differences in ICT adoption can reduce resources available to female entrepreneurs running small and medium enterprises, which may weaken competitive advantage through weaker resource capabilities (Orser et al., 2019; Benitez-Amado et al., 2010).

In the EU, women, youth and seniors are greatly under-represented amongst digital entrepreneurs, i.e. entrepreneurs pursuing business operations on digital platforms (OECD, 2021). Additionally, in the EU, women are less likely than men to report that they have access to entrepreneurship training programmes (OECD, 2021;2013). Economic forums such as the G20 have called for technology adoption initiatives and programmes that recognise the needs of women and immigrant entrepreneurs (Orser et al., 2019; OECD, 2021; 2013). Indeed, the OECD (2021) recommends that bodies offer digital entrepreneurship training programmes for women, youth and immigrants in a process to gain access to digital business operations.

The present study evaluates the role of business apps training in reducing the gender digital divide amongst immigrant entrepreneurs running small firms. The orientation of the study is based upon the theoretical foundations of the Human Capital framework which evaluates the positive relationship between the adoption of ICT and firms' operational performance and outputs (Giotopoulos et al., 2017). Similarly, the study adopts the Artificial Intelligence Capital framework, evaluating that training in advanced technology, including business apps, can boost individuals' knowledge, skills, and capabilities related to business environments (Drydakis, 2024a). Moreover,

the study adopts the theoretical lens of the Business Apps Training framework (Drydakis, 2022a), indicating that entrepreneurs through business apps training interventions can experience higher internet/digital skills and firms can experience increased digital competencies. In addition, the current research project utilises feminist theories of technology (Wajcman, 2010), proposing associations between ICT and women's empowerment. The study focuses on small firms run by immigrant entrepreneurs in Greece (Attika), Cyprus (Limassol, Larnaca, Nicosia, Paphos), and the UK (East of England). In 2021, the research team of the Faculty of Business and Law of Anglia Ruskin University offered a three-month online session on business apps to interested immigrant entrepreneurs.

The current study indicates that immigrant populations should not be treated as a homogeneous entity (Drydakis, 2024b). Male immigrant entrepreneurs' realities when it comes to ICT might be different compared to female immigrant entrepreneurs' realities. The intersectionality between socio-economic and cultural conditions can be thought of as a web, where different characteristics connect, compounding and exacerbating each other and thus affecting immigrant women's realities related to technology (Drydakis, 2024b; Nash, 2008; Crenshaw, 1989).

This study contributes to the literature, as there is a lack of research on the association between business apps training and the gender digital divide. Firstly, the study examines whether business apps training is associated with immigrant entrepreneurs' internet/digital skills, and then assesses whether, after the training, there is a decline in the gender digital divide between immigrant male and female entrepreneurs. The study synthesises theoretical and empirical frameworks to propose novel hypotheses on the subject matter. Such a specification is missing in the empirical and theoretical ICT literature, and the implications of each hypothesis might inform policy making. Similarly, the study assesses the association between business apps training and the digital competencies of firms run by immigrant entrepreneurs, as well as whether, after the training, there is a decline in the gender digital competencies gap between firms run by immigrant male and female entrepreneurs. The practical implications of such an assessment might be useful for policy makers, apps developers and firms (Orser et al., 2019).

Second, the study examines whether business apps training is associated with immigrant entrepreneurs' empowerment and then assesses whether, after the training, there is a decline in the gender empowerment gap between immigrant male and female entrepreneurs. The factors which positively impact immigrants' empowerment have not received attention in the literature. It is of importance to examine whether business apps training can enable immigrant groups to boost their potential, abilities and resources and balance the scales of ethnic and gender equality and equity

(Çetin et al., 2021; Mackey and Petrucka, 2021; Asongu and Odhiambo, 2020). Hence, the present study is novel as it evaluates interventions to use ICT to empower immigrant men and women, and calls for policy actions to address gender disparities related to the level of empowerment between male and female immigrant entrepreneurs.

Third, in the ICT literature, longitudinal evaluations are limited (Drydakis, 2022a;b; 2021). The study provides outcomes through a longitudinal data set aiming to capture unobserved heterogeneity and offer better-informed evaluations (Andreß et al., 2013). Moreover, this study, by employing data from three European countries, assesses the hypothesis against each country. Such an approach offers a robust evaluation, enabling the generalisation of the study's outcomes.

Given the massive contribution of small and medium firms to countries' growth, an interest in boosting entrepreneurs' skills and small firms' digital competencies can form interventions for action (Chan et al., 2020; OECD, 2017). Small and medium firms risk their performance, profitability and sustainability if they do not embrace digital transformation, i.e. usage of new kinds of technology in their operations (Ulas, 2019; Li et al., 2017). Entrepreneurs often renounce digital initiatives because they are unaware of how to incorporate them into their practices (Lehner and Sundby, 2018; Reis et al., 2018). The main reason why small and medium firms experience a digital divide is not the lack of access to digital technology, but rather the firm's lack of relevant knowledge and education (Horváth and Szabó, 2019; Lehner and Sundby, 2018; Reis et al., 2018).

At the same time, immigrant entrepreneurial activities contribute to economic growth (Krol, 2021; Lofstrom and Wang, 2019; European Economic and Social Committee, 2012). Immigrant entrepreneurship has become one of the driving forces of both national and regional economies (Krol, 2021; Lofstrom and Wang, 2019). Immigrants bring new ideas for potential new products and better ways to produce existing products or services (Krol, 2021; Lofstrom and Wang, 2019). In Greece, Cyprus and the UK the increasing number of immigrant firms reflects a business reality calling for policies to support immigrant entrepreneurship (Cyprus Labour Institute, 2018; Hatziprokopiou and Frangopoulos, 2016; Jones et al., 2015). In the aforementioned regions, immigrant entrepreneurs are described as determined individuals, willing to work hard to see their firms grow (Cyprus Labour Institute, 2018; Hatziprokopiou and Frangopoulos, 2016; Jones et al., 2015).

Given the unique characteristics of small and medium firms, e.g. resource constraints (Drydakis, 2022b) and challenges for immigrant entrepreneurs relating to language, culture and community, as well as restricted access to information and resources (Drydakis, 2022a), ways to boost immigrants' entrepreneurial activity by enhancing their internet/digital skills should be of

interest (Drydakis, 2022a). Such a policy could address the ethnic digital divide, as well as the gender digital divide within immigrant populations (Chen et al., 2020; Gurung, 2018). Under-represented population groups in entrepreneurship, such as women and immigrants, are more likely to benefit from certain features of digital technology for business creation and growth, including the lower start-up costs required for many digital businesses and the wider access to external markets offered by the internet (OECD, 2021).

The remainder of the study is structured as follows: the next section presents the study's hypotheses, whilst Section 3 details the data collection as well as the nature and context of the business apps training, and Section 4 provides the variables. Following this, Section 5 presents the descriptive statistics, with the regression outcomes put forth in Section 6, before the discussion is dealt with in Section 7.

2. Theoretical framework

Small and medium enterprises have invested in strategies to exploit the potential of ICT by adopting technology-enabled tools to boost their operations and performance (Drydakis, 2022b; Lehner, and Sundby, 2018). The human capital framework evaluates the positive association between the adoption of ICT and firms' performance (Giotopoulos et al., 2017). Indeed, the Artificial Intelligence Capital framework suggests that training in advanced technology can increase individuals' knowledge, skills, and capabilities, which are rewarded traits in business environments (Drydakis, 2024a). The beneficial exploitation of ICT requires certain digital skills that firms can gain through training (Drydakis, 2022a; OECD; 2021; European Commission, 2019). Digital skills are regarded as traits that enable firms to exploit opportunities provided by ICT, thus ensuring more efficient business performance (ITU, 2020). Internet/digital skills training can increase digital skills amongst trainees and the level of ICT used in small and medium firms (Azevedo and Almeida, 2021; Giotopoulos et al., 2017; Casalino et al., 2012). The adoption of ICT, and specifically free access to business apps, serves to offset relatively smaller amounts of inaugural financial and human resources amongst SMEs (Orser et al., 2019). User-friendly business apps can alter the ways in which entrepreneurs operate and run their firms (Orser et al., 2019).

Training on internet/digital skills and business apps can raise awareness of ICT amongst small and medium firms and can inspire and encourage trainees to go digital (OECD, 2021; Giotopoulos et al., 2017). Indeed, the Artificial Intelligence Capital framework suggests that training in advanced technology can increase individuals' knowledge, skills, and capabilities, which are rewarded traits in business environments (Drydakis, 2024a).Similarly, training on automation

and innovation in such firms increases the flexibility of staff who want to improve their digital skills (Casalino et al., 2012). Business apps training in small firms run by immigrant populations has been found to be associated with entrepreneurs' positive attitudes towards technology, willingness to change relating to technology, skills and operations, and increased use of business apps indicating a reduction in the ethnicity-based digital divide (Drydakis, 2022a). Training on digital transformation in small and medium firms brings favourable evaluations amongst trainees in relation to the concepts, methodologies and tools taught during training (Azevedo and Almeida, 2021).

Technology is playing a critical role in increasing women's learning accessibility and choice in the socio-economic realm (Niroo and Crompton, 2022; OECD; 2021; Gichuki and Mulu-Mutuku, 2018). Women's advancements through access to technology, information, and training have promoted higher female engagement in the formal economy, scientific field and production (Çetin et al., 2021). ICT interventions play an important role in supporting the development of women's potential, skills and resources in the overarching areas of education, lifestyle, entrepreneurship and health prevention (Mackey and Petrucka, 2021; UNESCO, 2018; Sarvimaki, and Hämäläinen, 2016). The present study indicates that business apps training can boost immigrant entrepreneurs' internet/digital skills and reduce the gender internet/digital skills gap amongst those immigrant entrepreneurs.

The study hypotheses are as follows:

Hypothesis 1a. Business apps training is associated with increased internet/digital skills for immigrant entrepreneurs running small firms.

Hypothesis 1b. Business apps training is associated with a reduced gender internet/digital skills gap amongst immigrant entrepreneurs running small firms.

Training on business apps can help small and medium firms to learn and use digital services to support business operations (Basri, 2021; Drydakis, 2022a;b). Business apps can support a vector of business operations in areas such as sales, communication, finance, customer relationship management and time management services (Drydakis, 2022b; Hamal and Senvar, 2021; Basri, 2021; Pérez et al., 2019). Emerging literature indicates that small and medium firms utilise apps supported by advanced technology to boost innovation, sustain competitive advantages, and achieve operational efficiencies (Millán, et al., 2021; Chan et al., 2020; Drydakis, 2022b).

Digital competence consists of the ability of firms to adopt and use new ICT to analyse digital information in a process to solve business problems and deal with organisational practices (Vieru, 2015). Business apps training can support small and medium firms in boosting their digital competencies (Millán, et al., 2021; Oberländer et al., 2020; Drydakis, 2022a). Learning, practising and adopting business apps can facilitate immigrant firms' digital transformation, helping them to boost their management efficiency and thus leading to a reduction in the ethnicity-based digital divide (Drydakis, 2022a). When digital platforms facilitate marketing systems, virtual communication, pricing and cash predictions, online reviews, cybersecurity, recruitment, and legal services, then technology gives firms a greater chance to improve efficiency (Drydakis, 2022b).

A lack of awareness of the benefits of ICT, and little or no specific training, are systemic barriers associated with small and medium enterprises' digital divide (Orser et al., 2019; Barba-Sánchez et al., 2007). Mobile apps are helpful tools for immigrants and women, allowing them to learn, share, and gain awareness in different fields, including entrepreneurship (Çetin et al., 2021; Orser et al., 2019). In female populations, positive experiences of ICT are related to enabling easy access to information and methods for sharing it with positive impacts on their employment (Çetin et al., 2021). Learning gained from access to information via technology boosts women's resources as well as their abilities to make decisions on matters of importance (Çetin et al., 2021; Mosedale, 2005). Indeed, when women engage with technology and business apps, which often does not require significant training investment, this can positively impact on female entrepreneurship and decision-making concerning online selling, finance and management (Çetin et al., 2021; Gichuki and Mulu-Mutuku, 2018). The current study proposes that business apps training can increase the digital competencies of small firms run by immigrant entrepreneurs and reduce the gender digital competencies gap amongst immigrant entrepreneurs.

The study's hypotheses are as follows:

Hypothesis 2a. Business apps training is associated with increased digital competencies for small immigrant firms.

Hypothesis 2b. Business apps training is associated with a reduced gender digital competencies gap amongst small immigrant firms.

Entrepreneurship and vocational training targeting minoritized populations can bring about positive externalities ranging from societal integration (Drydakis, 2022a; UNESCO, 2018;

Sarvimaki and Hämäläinen, 2016) to personal development (Marchand and Dijkhuizen, 2018). ICT has the potential to boost immigrants' integration in host countries and to challenge traditional gender roles for women who have limited skills or who lack the resources to invest in higher education (Drydakis, 2021; Hilbert, 2011; Kelkar and Nathan, 2002).

Better access to ICT can narrow both the ethnicity and gender digital divide whilst also boosting women's empowerment (Drydakis, 2022a; 2021; Mackey and Petrucka, 2021; Wajcman, 2010). Empowerment is used as a goal and as an outcome to achieve social justice and ethnic and gender equality (Mosedale, 2005). Empowerment is achieved when marginalised communities have the knowledge, resources, agency, and capabilities to execute decisions on matters of importance (Mackey and Petrucka, 2021; Mosedale, 2005).

As women have opportunities with technology, they are able to gain access to information, learn, and make decisions that overcome social, political, and economic obstacles, resulting in higher leadership and empowerment (Çetin et al., 2021; Asongu and Odhiambo, 2020; Cummings and O'Neil, 2015; Wajcman, 2010). It is suggested that technology is the catalyst for women's empowerment, as it provides different ways of accomplishing tasks at any time and location (Çetin et al., 2021). Different types of technology, including business apps, are used by women as a tool for empowerment (Çetin et al., 2021). Business apps training could boost female entrepreneurs' participation within the information sphere and introduce technical skills to increase capacity building, potential and decision-making (Çetin et al., 2021; Asongu and Odhiambo, 2020; Cummings and O'Neil, 2015; Wajcman, 2010). The present study suggests that business apps training boosts immigrant entrepreneurs' empowerment and reduces the gender empowerment gap amongst immigrant entrepreneurs.

The hypotheses in this regard are as follows:

Hypothesis 3a. Business apps training is associated with increased empowerment for immigrant entrepreneurs running small firms.

Hypothesis 3b. Business apps training is associated with a reduced gender empowerment gap amongst immigrant entrepreneurs running small firms.

3. Business apps training

3.1 Recruitment of firms

As per Drydakis (2022a), in the current study a Google search was employed to identify immigrant communities originating from Africa and Asia in Greece (Attica), Cyprus (Limassol, Larnaca, Nicosia, Paphos) and the UK (East of England). These communities were emailed an invitation to participate in the study. The opening letter provided information regarding the nature and aim of the study, i.e. to offer, free of charge, online digital training on popular business apps to immigrant entrepreneurs running small firms. The invitation indicated that potential participants were required to have a PC, a smartphone, and access to e-meetings apps (which were available free of charge). The participants had to provide their email addresses to receive instructions for the e-training and were informed that, before and after the training, e-surveys would be forwarded to their email. The study followed the usual procedures for securing ethics approval and ensuring the anonymity of the participants. Participants were free to withdraw from training and follow-up data gathering at any time. It was mentioned that the research team did not have any financial incentive and was not affiliated with the business app developers.

In Greece and Cyprus, the entrepreneurs confirmed their participation by providing written informed consent and completing an e-survey between January and February 2021. This data set, before the business apps training, was designated wave 1. The business apps training took place between February and April 2021 in four e-training sessions. Each e-session lasted three hours. During and after the training, four additional e-meetings were offered to address any queries. The follow-up e-survey was conducted between May and June 2021 (i.e. after the business apps training, or wave 2). In the UK, participants completed a preliminary e-survey between September and October 2021 (wave 1). The e-training took place between October and December 2021, and the follow-up e-survey was conducted between January and February 2022 (wave 2).

3.2 Utilised business apps

Business apps were identified through the Google Play Store. As in Drydakis (2022a), the apps were grouped into nine categories: (i) communication, (ii) networking, (iii) social media, (iv) customer relationship management, (v) payments, (vi) accounting and finance, (vii) managing inventory, (viii) team and time management, and (ix) project management. The top three ranked apps based on app performance and users' reviews were selected in each thematic. IT and business personnel at Anglia Ruskin University and the University of Cambridge assessed the top three apps per thematic analysis using Martin et al.'s (2013) protocol. The protocol consists of five steps, including: (i) identifying all potentially relevant apps, (ii) removing old versions of each app, (iii) identifying the main functional requirements and excluding all apps that do not offer this

functionality, (iv) identifying all secondary requirements, and (v) constructing tasks to test the main functional requirements.

Drydakis (2022a) presents an evaluation of how Martin et al.'s (2013) protocol was adopted in this study to screen each business app. The actual assessment scores are offered in Drydakis (2022a). Each app underwent keystroke level-orientated modelling to evaluate efficiency (Card et al., 1980). Moreover, usability heuristic evaluation (Bertini et al., 2009) was performed by assessing the following categories: (i) visibility of system's status and losability/findability of the device, (ii) match between system and the real world, (iii) consistency and mapping, (iv) good ergonomics and minimalist design, (v) ease of input, screen readability, and glanceability, (vi) flexibility and efficiency of use and personalisation, (vii) aesthetic, privacy, and social conventions, and (viii) realistic error management. The apps passed the various tests since there were no usability problems (Drydakis, 2022a).

During the usability heuristic evaluation stage, the following operations per business category were assessed. As per Drydakis (2022a), communication apps were screened on internal and external e-interactions and e-information sharing operations. Networking apps were assessed against processes related to sending updates on the go, adding new connections, recruiting new hires, following inspirational firms and people, and considering competitor firms' strategies. Moreover, social media apps were evaluated on operations dealing with planning, promoting, and monitoring projects by connecting with social channels. Furthermore, customer relationship management apps were assessed on a vector of processes, including tasks related to managing customer profiles. Payment apps were evaluated based on operations related to reviewing business analytics data, monitoring selling items, and processing credit cards, checks, and invoices. Following this, accounting and finance apps were assessed on operations dealing bookkeeping processes, including invoicing, expenses, and payroll. Managing inventory apps were screened on operations related to creating product catalogues, tracking and managing stock and sales, as well as making purchase orders. In addition, team and time management apps were assessed based on operations related to managing payroll and benefits, as well as calculating and filing payroll taxes. Finally, project management apps were evaluated on processes related to managing projects, workflows, and deadlines across alternative business operations.

3.3 Business apps training context

The business apps covered in the training aimed to optimise firms' day-to-day processes, and extend business functionality and productivity. The business apps training was structured to

offer an introduction to the relevance of each domain in the business context, present the series of tasks that each app could offer, present technical information on how to download and install each app, offer a manual-orientated presentation on how to use each app, and practice with case studies to showcase how each app works (Drydakis, 2022a). During the first e-session, the participants were informed of how the research team selected and screened the apps. In addition, communication and networking apps were presented. In the second e-session, social media and customer relationship management apps were demonstrated. In the third e-session, payments and accounting/finance apps were covered, whilst in the fourth e-session managing inventory, team, time, and project management apps were presented.

4. Variables

In the present study, the main independent variable of interest was the so-called "Business Apps Training", which captures two time periods: before the business apps training and after the business apps training. The e-surveys included questions to capture firms' characteristics, such as years of operation and sector of operation, and the entrepreneurs' demographic characteristics, such as gender and level of human capital.

The Internet Skills scale (Van Deursen et al., 2016) was utilised to evaluate Hypotheses 1a and 1b. The inventory measures entrepreneurs' internet/digital skills and consisted of 35 items covering operation, information navigation, social, creative and mobile skills. The items capture thematic information, such as whether individuals know how to "adjust privacy settings", "design a website", and "install apps on a mobile device". The responses were scored via a five-point Likert scale ranging from "Not at all true of me" to "Very true of me". Higher scores indicate increasing levels of internet/digital skills (Van Deursen et al., 2016).

The Digital Competencies scale (Drydakis, 2022a) was employed to assess Hypotheses 2a and 2b. The scale measures entrepreneurs' reflection on the level of their firm's digital competency. The scale captures competencies in nine domains: (i) communication operations in relation to internal and external e-interactions, (ii) networking operations in relation to recruiting new hires, and considering competitors' strategies, (iii) social media engagement in relation to planning, promoting and monitoring projects, (iv) customer relationship management in relation to managing customer profiles by sending marketing and outreach messages, (v) payment services in relation to reviewing business analytics data, (vi) accounting and finance services in relation to organising bookkeeping processes, (vii) inventory operations in relation to tracking and managing stock and sale, (viii) team and time management services in relation to managing payroll and benefits, and (ix) project management services in relation to managing projects. The responses were scored via a

five-point Likert scale ranging from “Very strong” to “Very weak”, with higher scores suggesting higher levels of digital competencies (Drydakis, 2022a).

The Empowerment scale (Rogers et al., 1997) was utilised to assess Hypotheses 3a and 3b. The measure consists of 28 items representing five general thematic factors: self-esteem, power-powerlessness, community activism and autonomy, optimism and control over the future, and righteous anger. The scale aims to capture individuals’ perceived ability to make decisions and have control over their life, with an emphasis on the development of a positive self-concept and personal competence. Some of the statements are as follows: “I see myself as a capable person”, “I am often able to overcome barriers” and “Working with others in my community can help to change things for the better”. The responses were scored via a four-point Likert scale ranging from “Strongly agree” to “Strongly disagree”, with higher scores suggesting higher levels of empowerment (Rogers et al., 1997).

5. Descriptive statistics

Table 1 presents the descriptive statistics of the sample. Panel I displays data from Greece, whilst Panel II shows data from Cyprus, and Panel III puts forth data from the UK. Further, Panel IV pools the data, presenting information for the three countries (total sample). In Panel IV, the data set consists of 129 firms. In wave 1, a total of 129 entrepreneurs completed the e-survey (i.e. before the business apps training), and in wave 2 the same entrepreneurs provided follow-up information (i.e. after the business apps training). In Panel IV, it is found that the majority of the firms were from the UK (58.1%), followed by Greece (30.2%) and Cyprus (11.6%). Regarding the entrepreneurs’ profile, it is found that 79.8% were male. The mean age was 34.6 years, and 9.3% of the entrepreneurs had a higher education degree. In the sample, 55.0% were from Africa, and the rest were from Asia (44.9%). The immigrants resided in the host countries for a mean of 11.6 years. It is found that the mean figure, in terms of the firms’ years of operation, was 5.2 years. The average number of employees in the firms was of 5.5, and 8.5 of the entrepreneurs owned the firm’s premises. Regarding the sector of operation, most were involved in services (38.7%), hospitality (31.0%), and trade (30.2%).

[Table 1]

In Table 2 the Cronbach’s alpha coefficients are presented for the total sample before and after the business apps training. In both cases, the internet skills/digital scale, the digital competencies scale, and the empowerment scale, surpass the Cronbach’s alpha threshold (a=0.70),

thus indicating internal consistency (Cortina, 1993). The Cronbach's alpha coefficients are expected given the number of items per scale (Cortina, 1993).

[Table 2]

Table 3 offers information on the three scales based on the total sample. In Panel I, it is found that entrepreneurs had higher levels of internet/digital skills after the business apps training (3.0 versus 2.7, $p<0.01$). Similarly, there was an increase in firms' digital competencies after the business apps training (2.4 versus 2.1, $p<0.01$), with entrepreneurs feeling more empowered after training (2.5 versus 2.2, $p<0.01$).

In Table 3, Panels II and III present relevant information per gender. Before and after the business apps training, female entrepreneurs experienced a lower level of internet/digital skills than that experienced by male entrepreneurs (i.e. there was a gender internet/digital skills gap amongst entrepreneurs). It is found that, before and after the business apps training, firms run by female entrepreneurs experienced lower digital competencies than those experienced by firms run by male entrepreneurs (i.e. there was a gender digital competencies gap amongst firms). It is observed that, before and after the business apps training, female entrepreneurs experienced a lower level of empowerment than that experienced by male entrepreneurs (i.e. there was a gender empowerment gap amongst entrepreneurs). Importantly, it is found that, before the business apps training the gender internet/digital skills gap amongst entrepreneurs was 20.8% ($p<0.01$), falling to 10.5% ($p<0.01$) after the business apps training. Moreover, before the business apps training the gender digital competencies gap amongst firms was 25.1% ($p<0.01$), falling to 17.1% ($p<0.01$) after the business apps training. In addition, before the business apps training the gender empowerment gap amongst entrepreneurs was 16.2% ($p<0.01$), falling to 12.0% ($p<0.01$) after the business apps training.

[Table 3]

Table 4 presents information on the three scales per country. It is found that the UK experienced higher levels of entrepreneurs' internet/digital skills, firms' digital competencies, and entrepreneurs' empowerment than did Greece and Cyprus. Table 4 confirms the patterns presented in Table 3. For instance, in the UK, before the business apps training the gender internet/digital skills gap amongst entrepreneurs was 22.2% ($p<0.01$), falling to 7.9 ($p<0.01$) after the business apps training.

[Table 4]

6. Estimates

Table 5 provides random effects estimates for the total sample. Given the longitudinal nature of the data, and the need to incorporate time invariant information (i.e. gender), random effects models were employed (Morgan, 2013). Although fixed effects models could remove omitted variable bias (Morgan, 2013), the research questions of the study required the incorporation of time invariant information into the empirical specification. The random effects models included information relating to country, firms' sector of operation, years of operation, number of employees, ownership of the business premises, entrepreneurs' age, gender, continent of origin, higher education degree, and years in the host country, business apps training and an interaction between entrepreneurs' gender and business apps training. It is indicated that better-informed specifications can reduce omitted variable bias (Clarke, 2005). The study reports marginal effects at the mean of each continuous covariate (Wooldridge, 2010). The marginal effects of the dichotomic variables are calculated as the discrete change in the prediction equation as the covariate changes from zero to one (Wooldridge, 2010).

In Table 5, in Model I it is observed that business apps training is associated with increased internet/digital skills for entrepreneurs ($b=0.508$, $p<0.01$ or 8.7%), and a reduced gender internet/digital skills gap amongst entrepreneurs ($b=-0.272$, $p<0.01$ or -3.7%). Based on the estimates, Hypotheses 1a and 1b can be accepted.

Model II reports that business apps training is associated with increased digital competencies for firms ($b=0.452$, $p<0.01$ or 9.8%), and a reduced gender digital competencies gap amongst firms ($b=-0.269$, $p<0.01$ or -4.6%). Hypotheses 2a and 2b can thus be accepted.

In Model III it is found that business apps training is associated with increased empowerment for entrepreneurs ($b=0.313$, $p<0.01$ or 6.5%), and a reduced gender empowerment gap amongst entrepreneurs ($b=-0.066$, $p<0.10$ or -1.1%). Hypotheses 3a and 3b can therefore be accepted.

[Table 5]

Table 6 offers random effects estimates per gender. In Models I-III, it is found that business apps training is associated with increased internet/digital skills for male entrepreneurs ($b=0.236$, $p<0.01$ or 3.9%), increased digital competencies for firms run by male entrepreneurs ($b=0.183$, $p<0.01$ or 3.8%), and increased empowerment for male entrepreneurs ($b=0.246$, $p<0.01$ or 5.0%).

In Models IV-VI, it is found that business apps training is associated with increased internet/digital skills for female entrepreneurs (b=0.508, p<0.01 or 10.0%), increased digital competencies for firms run by female entrepreneurs (b=0.452, p<0.01 or 11.9%), and increased empowerment for female entrepreneurs (b=0.313, p<0.01 or 7.3%). In all cases, the magnitude of the estimates is higher for female entrepreneurs than for male entrepreneurs. That is, female entrepreneurs are found to experience higher advancements due to business apps training than male entrepreneurs. This insight might make it possible to explain the declines in the assigned gender gaps.

[Table 6]

Table 7 presents OLS estimates before and after the business apps training. In Model I, it is found that, before the business apps training, the gender internet/digital skills gap amongst entrepreneurs is 14.7% (b=0.510, p<0.01). Model IV indicates that, after the business apps training, the gender internet/digital skills gap amongst entrepreneurs is 6.1% (b=0.236, p<0.01).

Model II illustrates that, before the business apps training, the gender digital competencies gap amongst firms is 19.7% (b=0.540, p<0.01). Model V reports that, after the business apps training, the gender digital competencies gap amongst firms is 8.7% (b=0.264, p<0.01).

In Model III, it is observed that, before the business apps training, the gender empowerment gap amongst entrepreneurs is 13.4% (b=0.382, p<0.01). However, Model VI reports that, after the business apps training, the gender empowerment gap amongst entrepreneurs is 10.0% (b=0.316, p<0.01).

[Table 7]

7. Discussion

7.1 Evaluation and policy implications

The present study contributed to the literature in various ways, presenting a systematic method with which to evaluate the relationship between business apps training and advancements in immigrant entrepreneurs' digital skills. The study's outcomes confirmed that not everyone benefits equally from ICT, as there were differences between Greece, Cyprus and the UK in internet/digital skills and level of digital competencies in immigrant populations (Acilar and Sæbø, 2023). Because economic success has become dependent on ICT, inequality in digital skills between regions constitutes a societal challenge (Olphert and Damodaran, 2013; Acilar and Sæbø, 2023). The

present study indicates that the digital divide between regions might prevent entrepreneurs in certain regions from enjoying the benefits and advantages of this technology.

The study found that, amongst immigrant entrepreneurs, women are the most disadvantaged group in comparison to men when it comes to internet/digital skills at the individual level, digital competencies at the firm level, and empowerment at the individual level. The outcomes confirmed that having free access to ICT, such as business apps, cannot guarantee that people will exploit their potential (Rashid, 2016). The outcomes are in line with review studies which concluded that the gender digital divide is not only a problem for developing nations, and indeed inequalities between genders when it comes to using ICT can also be identified in developed countries (Acilar and Sæbø, 2023).

The study concluded that business apps training can improve both male and female immigrant entrepreneurs' internet/digital skills and reduce the gender internet/digital gap between male and female immigrant entrepreneurs. Similarly, business apps training can increase firms' digital competencies and reduce the gender digital competencies gap between firms run by male immigrant entrepreneurs and firms run by female immigrant entrepreneurs. That is, business apps training can reduce the gender digital divide at individual and firm level. Moreover, the study found that business apps training can boost both male and female immigrant entrepreneurs' empowerment and reduce the gender empowerment gap between male and female immigrant entrepreneurs. The outcomes were found to be consistent, regardless of the region, i.e. Greece, Cyprus, and the UK, thus indicating that business apps training can bring about positive outcomes for immigrant entrepreneurs' experiences related to digital skills.

The study proposes that business apps training can boost entrepreneurs' digital literacy, helping them to better facilitate operations in digital environments and access the wide range of knowledge embedded in the digital environment (Drydakis, 2022a;b; Millán, et al., 2021). In the present study, the nature of the business apps training aimed to introduce entrepreneurs to tools that enable them to identify new opportunities and/or adapt systems to boost performance, explore new opportunities by adopting technology-enabled tools to monitor how core technology and environments are changing, engage with external communities to run and validate business ideas, uncover industry patterns, develop processes and products, and monitor market changes (Drydakis, 2022a;b; Millán, et al., 2021; Chan et a., 2020; Vial, 2019; Ala-Mutka, 2011).

European policy makers should recognise the important asset that entrepreneurship and immigrant entrepreneurs represent for Europe, both locally but also increasingly in international markets, where there remains a demand for goods and services originating from Europe (OECD;

2021; European Economic and Social Committee, 2012). Ways to better support immigrant entrepreneurs are of importance, and business apps training targeting immigrant entrepreneurs running small and medium firms might boost their performance (Drydakis, 2022a;b). Since digital transformation is perceived as a crucial lifelong learning and development challenge (Hamburg, 2020; Oberländer et al., 2020), initiatives should support entrepreneurs and firms in developing their internet/digital skills and competencies towards digital transformation (Azevedo and Almeida, 2021). Research has found that e-learners who require digital knowledge are proactive learners and tend to make good use of what they learn (Drydakis, 2024a; 2022a; Azevedo and Almeida, 2021). Policy making should examine the construction of flexible digital training, with practical content to enable direct action; consideration should also be given to reducing tax laws so as to stimulate firms to provide ICT training programmes to employees at low or no cost (Drydakis, 2024a; European Commission, 2019; Oliveira and Martins, 2010).

The study proposes that business apps training can bring about a vector of positive outcomes, such as raising awareness of ICT amongst small and medium firms run by immigrant entrepreneurs, and increasing the motivation and flexibility of female immigrant entrepreneurs who want to improve their digital skills and lifelong learning (Drydakis, 2022a; OECD, 2021). Improving female immigrant entrepreneurs' realities requires intersectional approaches that address a vector of socio-economic characteristics which influence the digital divide (Drydakis, 2024b; Nash, 2008; Crenshaw, 1989). Socio-economic disadvantage can become difficult to escape, and being able to tackle this complexity requires an understanding of how these linkages work (Nash, 2008; Crenshaw, 1989). Intersectionality should encourage researchers and policy makers to evaluate the substantial heterogeneity within immigrant populations, and the interplay of socio-economic and cultural factors producing digital disparities (Drydakis, 2024b; Orser et al., 2019; Nash, 2008; Crenshaw, 1989). Such an approach could provide a unifying framework for the development of targeted and effective interventions and policies (Drydakis, 2024b; Orser et al., 2019).

The study presented patterns indicating that access to business apps training can contribute to bridging the gender digital divide in immigrant populations. The findings may inform policy makers, as well as education and training authorities, when it comes to boosting the engagement of under-represented groups, such as immigrant groups, and ensuring that programmes are responsive to societal needs. The gender digital divide cannot be reduced unless socio-economic inequalities and exclusions, as well as cultural disparities, are addressed (OECD, 2021; Acilar and Sæbø, 2023). Women's alienation from technology is a product of the historical and cultural construction of technology as masculine (Cronin and Roger, 1999). Because evidence indicates that the gender

digital divide might exist because women are less likely than men to receive technical education (Acilar and Sæbø, 2023; Pande and Weide, 2012), policies targeting women's participation in business apps training programmes should be considered. Effective efforts are needed to challenge gender stereotypes in ICT in order to motivate women to incorporate ICT into their daily life to gain an equal footing with men (Gurung, 2018). Gender-inclusive, user-friendly diagnostics and curricula may motivate women to investigate ICT that aligns with their business expectations (Orser et al., 2019).

The literature highlights that there is a need to consider how demography impacts on the adoption of ICT, as gender and technology can change with conditions, space, time, cultural embeddedness of gender and technology relations (Gupta, 2015; Masika and Bailur, 2015; Barua and Barua, 2012). Gender-centric ICT policies, which consider socio-economic and cultural differences at the local and national levels, and which provide easy availability, more access time and use of ICT, are recommended to reduce the gender digital divide (Acilar and Sæbø, 2023). Policies have to promote women role models and support networks for women business owners (Orser et al., 2019). Nowadays, it is difficult to transform gender relations without engaging women in technology (Gurung, 2018; Faulkner, 2001). ICT's potential is critical when it comes to the UN's sustainable development goals for both men and women (Acilar and Sæbø, 2023; Hidalgo et al., 2020). Women's involvement in utilising ICT can support them socially and economically (Masika and Bailur, 2015).

The study found that business apps training was associated with immigrant entrepreneurs' empowerment, confirming that technology can boost empowerment for minoritized population groups (Mackey and Petrucka, 2021; Drydakis, 2021; Wajcman, 2010; Mosedale, 2005). The positive outcomes of ICT for minoritized population groups' empowerment through better access to education, increased employment and income, improvements in entrepreneurship and cost-effective health services, should be considered when formulating policy actions (Drydakis, 2021; 2022c; Hilbert, 2011). Longstanding inequalities prevent women from accessing ICT, thus leading to a vicious circle between digital exclusion, unemployment, low income and lacking education (Hilbert, 2011). Once there is access to ICT, this vicious circle can be turned into a virtuous circle (Hilbert, 2011). The various kinds of ICT can be powerful tools for women, allowing them to overcome discrimination and exclusion and participate in the decisions that determine their lives and the future of their communities (Hilbert, 2011). The more empowered and integrated immigrants are in host countries, the higher their net economic and fiscal contribution to the host's economy and the better the attitudes of the natives towards newcomers will be (Drydakis, 2012; 2013).

7.2 Limitations and future research

The study focused on small immigrant firms in Greece, Cyprus and the UK. The magnitude of the estimates may not be generalisable to entrepreneurs running medium and large firms or firms operating in other regions. Greece, Cyprus and the UK present a particularly important case for research on this subject matter, as their economies have experienced a massive economic recession since 2010, faced an increased immigrant population, and experienced the adverse socio-economic effects of the COVID-19 pandemic (Drydakis, 2022b; Cyprus Labour Institute, 2018; Hatziprokopiou and Frangopoulos, 2016; Jones et al., 2015). A higher number of observations from further countries could enable representative evaluations.

This study was conducted during the COVID-19 pandemic, and it has been reported that the utilisation of business apps reduced business risks caused by the COVID-19 pandemic (Drydakis, 2022b); thus, new studies should be conducted post-COVID-19 to determine whether the magnitude of the estimates might vary.

Although this study focused on immigrant entrepreneurs, the main outcome of the work might also apply to native entrepreneurs in the three regions under consideration. Future studies should compare business apps training payoffs between natives and immigrants. Moreover, whether business apps training affects firms' financial indicators, such as turnover, was not examined, and requires new research. In addition, new studies ought to consider additional sectors to examine the robustness of the present outcomes. Finally, further research is also needed regarding the question of how the level of a firm's innovativeness and immigrants' level of integration into host countries could moderate the current study's outcomes.

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Table 1. Descriptive statistics. Mean and standard deviation				
	Panel I Greece	**Panel II Cyprus**	**Panel III United Kingdom**	**Panel IV Total sample**
Entrepreneurs' gender: Male (%)	79.48 (0.40)	73.33 (0.45)	81.33 (0.39)	79.84 (0.40)
Entrepreneurs' age (c.)	32.43 (7.08)	34.33 (5.32)	35.89 (8.34)	34.66 (7.78)
Entrepreneurs' higher education (%)	10.25 (0.30)	6.66 (0.25)	9.33 (0.29)	9.30 (0.29)
Entrepreneurs' years of immigration in the host country (c.)	9.51 (1.97)	9.93 (2.12)	13.18 (6.18)	11.69 (5.18)
Entrepreneurs' continent of origin: Africa (%)	53.84 (0.50)	66.66 (0.48)	53.33 (0.50)	55.03 (0.49)
Entrepreneurs' continent of origin: Asia (%)	46.15 (0.50)	33.33 (0.48)	46.66 (0.50)	44.96 (0.49)
Firms' years of operation (c.)	4.00 (1.45)	4.8 (1.29)	6.01 (2.80)	5.26 (2.48)
Firms' number of employees (c.)	5.07 (3.51)	3.73 (0.96)	6.10 (2.92)	5.51 (3.06)
Ownership of the firms' premise (%)	7.69 (0.26)	6.66 (0.25)	9.33 (0.29)	8.52 (0.28)
Firms' sector: Hospitality (%)	35.89 (0.48)	33.33 (0.48)	28.00 (0.45)	31.00 (0.46)
Firms' sector: Services (%)	41.02 (0.49)	13.33 (0.35)	42.66 (0.49)	38.75 (0.48)
Firms' sector: Trade (%)	23.07 (0.42)	53.33 (0.51)	29.33 (0.45)	30.23 (0.46)
Firms' region: Greece (%)	100.00	-	-	30.23 (0.46)
Firms' region: Cyprus (%)	-	100.0	-	11.62 (0.32)
Firms' region: United Kingdom (%)	-	-	100.0	58.13 (0.49)
Number of firms	39	15	75	129

Notes: (c.) Continuous variable. Standard deviations are given in parentheses.

Table 2. Scales. Alpha coefficients

	Alpha coefficients		Number of items per scale	Number of firms
	Before the business apps training	**After the business apps training**		
Entrepreneurs' internet/digital skills	0.88	0.90	35	129
Firms' digital competencies	0.70	0.73	9	129
Entrepreneurs' empowerment	0.80	0.77	28	129

Notes: Total sample (Greece, Cyprus, United Kingdom).

Table 3. Scales. Descriptive statistics. Mean and standard deviation

	Panel I Men and women			Panel II Before the business apps training			Panel III After the business apps training		
	Before the business apps training	**After the business apps training**	**Difference [t-test]**	**Men**	**Women**	**Difference [t-test]**	**Men**	**Women**	**Difference [t-test]**
Entrepreneurs' internet/digital skills	2.76 (0.51)	3.05 (0.52)	0.29 or 10.5% [t=15.31]***	2.88 (0.48)	2.28 (0.32)	0.60 or 20.8% [t=6.00]***	3.12 (0.51)	2.79 (0.50)	0.33 or 10.5% [t=2.92]***
Firms' digital competencies	2.18 (0.49)	2.42 (0.56)	0.24 or 11.9% [t=6.62]***	2.23 (0.45)	1.67 (0.24)	0.56 or 25.1% [t=6.06]***	2.56 (0.53)	2.12 (0.43)	0.44 or 17.1% [t=3.87]***
Entrepreneurs' empowerment	2.26 (0.29)	2.52 (0.27)	0.26 or 11.5% [t=17.68]***	2.34 (0.26)	1.96 (0.22)	0.38 or 16.2% [t=6.62]***	2.58 (0.24)	2.27 (0.26)	0.31 or 12.0% [t=5.76]***
Number of firms	129	129		103	26		103	26	

Notes: Total sample (Greece, Cyprus, United Kingdom). Standard deviations are given in parentheses. (***) Statistically significant at the 1%.

Table 4. Scales. Descriptive statistics. Mean and standard deviation						
	Panel I Before the business apps training			Panel II After the business apps training		
	Men	**Women**	**Difference [t-test]**	**Men**	**Women**	**Difference [t-test]**
Greece						
Entrepreneurs' internet/digital skills	2.40 (0.12)	2.00 (0.11)	0.40 or 16.6% [t=8.41]***	2.57 (0.17)	2.27 (0.13)	0.30 or 11.6% [t=4.54]***
Firms' digital competencies	1.93 (0.42)	1.58 (0.17)	0.35 or 18.1% [t=2.31]**	2.17 (0.53)	1.83 (0.15)	0.34 or 15.6%, [t=1.78]*
Entrepreneurs' empowerment	2.10 (0.18)	1.77 (0.19)	0.33 or 15.7% [t=4.55]***	2.40 (0.15)	2.10 (0.12)	0.30 or 12.5% [t=5.00]***
Number of firms	31	8		31	8	
Cyprus						
Entrepreneurs' internet/digital skills	2.25 (0.18)	2.04 (0.03)	0.21 or 9.3% [t=2.19]**	2.52 (0.22)	2.30 (0.09)	0.22 or 8.7% [t=1.95]*
Firms' digital competencies	2.01 (0.11)	1.36 (0.02)	0.65 or 32.3% [t=3.44]***	2.24 (0.14)	1.72 (0.13)	0.52 or 23.2% [t=2.07]*
Entrepreneurs' empowerment	2.10 (0.19)	1.85 (0.05)	0.25 or 11.9% [t=2.45]**	2.39 (0.13)	2.17 (0.07)	0.22 or 9.2% [t=2.91]**
Number of firms	11	4		11	4	
United Kingdom						
Entrepreneurs' internet/digital skills	3.24 (0.22)	2.52 (0.25)	0.72 or 22.2% [t=10.14]***	3.51 (0.22)	3.23 (0.15)	0.28 or 7.9% [t=4.29]***
Firms' digital competencies	2.43 (0.38)	1.81 (0.21)	0.62 or 25.5% [t=5.76]***	2.82 (0.37)	2.41 (0.38)	0.41 or 14.5% [t=3.69]***
Entrepreneurs' empowerment	2.50 (0.18)	2.10 (0.16)	0.40 or 16% [t=7.50]***	2.71 (0.20)	2.40 (0.28)	0.31 or 11.4% [t=4.72]***
Number of firms	61	14		61	14	

Notes: Standard deviations are given in parentheses. (***) Statistically significant at the 1%. (**) Statistically significant at the 5%. (*) Statistically significant at the 10%.

Table 5. Estimates. Total sample			
	Model I Entrepreneurs' internet/digital skills	**Model II Firms' digital competencies**	**Model III Entrepreneurs' empowerment**
Business apps training^	0.508 (0.036)***	0.452 (0.077)***	0.313 (0.032)***
Entrepreneurs' gender: Male	0.509 (0.048)***	0.537 (0.095)***	0.382 (0.044)***
Business apps training × Entrepreneurs' gender: Male	-0.272 (0.041)***	-0.269 (0.086)***	-0.066 (0.036)*
Entrepreneurs' age	-0.001 (0.002)	0.015 (0.005)***	-0.002 (0.002)
Entrepreneurs' higher education	0.156 (0.056)***	0.131 (0.109)	0.058 (0.052)
Entrepreneurs' years of immigration in the host country	0.001 (0.004)	-0.011 (0.009)	0.003 (0.004)
Entrepreneurs' continent of origin: Africa^^	-0.021 (0.033)	0.083 (0.063)	0.034 (0.030)
Firms' years of operation	-0.022 (0.010)**	-0.017 (0.019)	-0.004 (0.009)
Firms' number of employees	0.004 (0.005)	0.003 (0.011)	-0.013 (0.005)**
Ownership of the firms' premise	0.100 (0.065)	0.263 (0.127)**	0.037 (0.061)
Firms' sector: Hospitality^^^	-0.001 (0.042)	-0.066 (0.081)	0.004 (0.039)
Firms' sector: Services^^^	-0.052 (0.040)	-0.025 (0.077)	-0.006 (0.037)
Firms' region: Greece[#]	-0.904 (0.039)***	-0.548 (0.076)***	-0.336 (0.036)***
Firms' region: Cyprus[#]	-0.943 (0.055)***	-0.557 (0.107)***	-0.361 (0.051)***
Wald x^2	1258.23	190.09	548.50
Prob>x^2	0.000	0.000	0.000
Observations	258	258	258

Notes: Random effects estimates. (^) The reference category is before the business apps training. (^^) The reference category is Asia. (^^^) The reference category is trade. ([#]) The reference category is the UK. Standard errors are given in parentheses. (***) Statistically significant at the 1%. (**) Statistically significant at the 5%. (*) Statistically significant at the 10%.

Table 6. Estimates per gender

	Men			Women		
	Model I Entrepreneurs' internet/digital skills	**Model II Firms' digital competencies**	**Model III Entrepreneurs' empowerment**	**Model IV Entrepreneurs' internet/digital skills**	**Model V Firms' digital competencies**	**Model VI Entrepreneurs' empowerment**
Business apps training^	0.236 (0.014)***	0.183 (0.040)***	0.246 (0.014)***	0.508 (0.057)***	0.452 (0.065)***	0.313 (0.045)***
Wald x^2	940.99	91.06	422.91	241.61	84.74	85.69
Prob>x^2	0.000	0.000	0.000	0.000	0.000	0.000
Observations	206	206	206	52	52	52

Notes: Random effects estimates. (^) The reference category is before the business apps training. The models incorporate information relating to firms' sector of operation, years of operation, number of employees, ownership of the business premise, region and entrepreneurs' age, continent of origin, higher education degree, and years of immigration in the host country. Standard errors are given in parentheses. (***) Statistically significant at the 1%.

Table 7. Estimates before and after the business apps training

	Before the business apps training			After the business apps training		
	Model I Entrepreneurs' internet/digital skills	**Model II Firms' digital competencies**	**Model III Entrepreneurs' empowerment**	**Model IV Entrepreneurs' internet/digital skills**	**Model V Firms' digital competencies**	**Model VI Entrepreneurs' empowerment**
Entrepreneurs' gender: Male	0.510 (0.050)***	0.540 (0.094)***	0.382 (0.043)***	0.236 (0.047)***	0.264 (0.091)***	0.316 (0.047)***
F	55.46	7.72	21.00	69.56	14.30	11.55
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000
Observations	129	129	129	129	129	129

Notes: OLS estimates. The models incorporate information relating to firms' sector of operation, years of operation, number of employees, ownership of the business premise, region and entrepreneurs' age, gender, continent of origin, higher education degree, and years of immigration in the host country. Standard errors are given in parentheses. (***) Statistically significant at the 1%.