Journal of Developmental Entrepreneurship
Vol. 26, No. 3 (2021) 2150017 (29 pages)

DOI: 10.1142/S1084946721500175

World Scientific
www.worldscientific.com

WHEN RISING TIDES LIFT SOME BOATS MORE THAN OTHERS: GENDER-BASED DIFFERENCES IN THE EXTERNAL ENABLEMENT OF ENTREPRENEURSHIP

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Received November 2020
Revised April 2021
Published

External enablers (EEs) are exogenous, macro-environmental forces that influence the rate, extent and substance of entrepreneurial activity. A steadily increasing body of empirical research has sought to identify, describe and predict the aggregate impact of EEs, yet few studies have assessed whether EEs exert similar or dissimilar effects across societal groups, and none to date have sought to ascertain whether EEs function in a gender-neutral fashion. The issue is important to address because it is common for governments to implement policies designed to leverage or mitigate the influence of EEs. Absent knowledge regarding the differential effects of EEs, policies may be enacted with an aggregate intent, but which may routinely disadvantage female entrepreneurs. To address this concern, we investigate the impact of a prominent EE (internet access) on entrepreneurial activity, employing a longitudinal design, consisting of 61 countries from 2004 to 2013. Our results suggest

that increased internet access is, in the aggregate, associated with heightened entrepreneurial activity, but the favorable effect for male entrepreneurs is markedly greater than that for female entrepreneurs. The findings reveal that gender-based disaggregation is critical in assessing the influence of EEs.

Keywords: Female entrepreneurship; external enablers; entrepreneurial action; transitional entrepreneurship; nascent-stage business venturing; environmental change; digital technology; GEM data; ICTs.

"Women are the largest untapped reservoir of talent in the world."

— Hillary Clinton

"Fully closing gender gaps in work would add as much as $28 trillion to annual GDP in 2025"

— McKinsey Global Institute Report, 2015

1. Introduction

As the epigraphs above convey, female entrepreneurs constitute an economic tour de force, but one that has remained under-utilized and under-supported; a stark reality that has attracted the attention of entrepreneurship scholars (Henry, Foss and Ahl, 2016). Although entrepreneurship rates among women are increasing, a sizeable gender gap persists (GEM Women Entrepreneurship Report 2016/17). Although gender parity in entrepreneurship could raise the global GDP by $1.5 trillion (BCG Report), institutional regimes, which play a role in shaping and influencing women's decisions to engage in entrepreneurship, continue to exhibit biases and resource disadvantages that pose impediments to business venturing by women (Anambane and Adom, 2018; Edelman *et al.*, 2018; Kanze *et al*., 2018; Swartz and Amatucci, 2018). Existing research shows that female-owned enterprises have historically benefited less in times of good business conditions and have suffered disproportionately more in times of bad business conditions (Pines *et al*., 2010; Thébaud and Sharkey, 2016). Now, in the midst of a global pandemic, it appears once again that women are bearing the brunt of these unfavorable times (Maxman, 2020). However, the exact nature of these differential impacts remains unclear because most of the available data consists of aggregate impacts and average levels of firm performance. The reliance upon mean effects for an aggregated pool of impacted firms obfuscates systematic differences that may exist among socio-demographic groups, including gender-based differences. As a result, scholars and policymakers know far less than they should about if and how macro-level drivers of entrepreneurial activity exert heterogenous impacts upon varied sub-groups. For example, research suggests that infrastructural improvements positively impact the overall rate of business venturing (Audretsch, Heger and Veith, 2015); yet scholars have not examined whether female-owned ventures share these benefits. Implicit assumptions that mean values drawn from aggregated data are an accurate measure of sub-group impacts is a dangerous policy and bad science. As such, a critical assessment of possible gender effects is long overdue.

To address this important gap in the literature on female entrepreneurship, we investigate the gender-based effects of external enablers (EEs) on entrepreneurial activity.

The EE framework, originated by Davidsson (2015), and subsequently elaborated through a rapidly increasing volume of scholarly work (e.g., Aldrich and Bradley, 2019; Bennett, 2019; Browder, Aldrich and Bradley, 2019; Chalmers, Matthews and Hyslop, 2019; Chen *et al*., 2020; Davidsson, Recker and von Briel, 2018; Obschonka and Audretsch, 2019), captures the influence exerted by exogeneous macro-environmental forces on entrepreneurial actions and outcomes (cf. Chen *et al*., 2020).

The EE framework offers fresh perspectives on the manner in "which entrepreneurial activity is constituted by a balanced nexus of factors related to both agents and environments" (Chen *et al*., 2020: 3; Davidsson *et al*., 2020). In particular, research on EEs has sought to identify the mechanisms that link macro-level circumstances to micro-level ideation, development and commercialization. However, the difficulty is that EEs do not activate entrepreneurship in a uniform fashion (Chen *et al*., 2020); therefore, are not sufficiently descriptive when examined in the aggregate. Although a central tenet of the EE framework posits differential influence based on demographics and other contextual conditions (Davidsson *et al*., 2020), few studies have assessed whether EEs exert the same or different effects across societal groups, and none to date have sought to ascertain whether EEs function in a gender-neutral fashion. Existing scholarly research has been more equivocal concerning the gender-based effects of differential access to high-technology (Jackson *et al*., 2011), including internet services (Bimber, 2000), without providing clear directionality on the impact of technology EEs. Answering the call by Brush *et al.* (2019) for a more thorough conceptualization of gender-related impacts, our study extends and enhances the EE framework by posing the question: *Do EEs differentially influence the rates of entrepreneurial activity among men and women*?

To address this question, we conducted a longitudinal analysis of the impact of increased internet access on rates of entrepreneurship among women and men in 61 countries. Our sample covers a ten-year period (2004–2013), which allows us to observe how varying diffusion rates of information and communication technologies (ICT) affect entrepreneurial activity. We drew data from the Global Entrepreneurship Monitor (GEM), the World Bank's Doing Business database, and the World Development Indicators (WDI). The results of our investigation support the assertion that internet access is, in aggregate, an EE of entrepreneurial activity. However, we also find that the positive impact of ICTs on entrepreneurship rates is significantly greater for men than for women. In this sense, the rising tide of technological enablement does not lift women's boats nearly as much as it lifts those of men.

Based on these findings, our study offers a number of contributions to the literature on EEs and female entrepreneurship. First, the scope of our investigation opens a door to a broader consideration of macro-environmental forces, which, while outside the control of individual entrepreneurs, are a vital facet of the individual-opportunity nexus (Shane and Eckhardt, 2003). Although existing research suggests infrastructure has positive effects on entrepreneurial activity (Audretsch, Heger and Veith, 2015), recent research indicates that EEs play a complex role in shaping entrepreneurial action (Chen *et al*., 2020). In this study, we examine how access to ICTs, as an important type of EE, impacts the rate of female entrepreneurship viz-a-viz entrepreneurship by men. ICTs are widely lauded as a potent

enabling factor, which empowers female entrepreneurs by enabling them to bypass the structural constraints of their local environments (Crittenden, Crittenden and Ajjan, 2019). However, our study indicates that although access to ICTs does positively impact business venturing by women, ICTs have a vastly more positive impact on business venturing by men, thereby confirming the presence of non-uniform, gender-based impacts by EEs on entrepreneurial action.

Second, we demonstrate the extent to which a disaggregation of EEs is an essential precondition to assessing the differential effects of EEs on entrepreneurial activity. Davidsson and colleagues (2020) point out the need for more and better EE research that accounts for differences arising as a consequence of demographic conditions and contexts. Our findings are among the first to underscore the importance of recognizing non-uniformity of impacts arising from the emergence of EEs. Third, our findings contribute fresh evidence that scholars are still a long way from having fully identified and described gender-based differentials in entrepreneurial action. Our research design displays, in cross-cultural fashion, that EEs may magnify underlying gender biases rather than instigating transformational change. Finally, our investigation contributes more broadly to research on the transitional impacts of ICTs on the rate and nature of nascent-stage venturing. By virtue of these findings, our study offers potent implications for both policy and practice. Policy action to address disparities involves complex trade-offs, stemming from heterogenous outcomes across sub-groups. This is particularly true when assessing gender-based impacts.

2. Literature Review

The essence of transitional entrepreneurship involves entrepreneurial action in the context of significant life or career changes (Henley, 2007). As noted at the outset, the vast array of macro-environmental forces — collectively framed as EEs (Davidson *et al*., 2020) — are exogenous drivers of the rate and substance of business venturing, including many of the forces that drive transitional entrepreneurship. However, EEs do not impact all individuals, firms, industries, markets and societies in precisely the same fashion (Chen *et al*., 2020). For scholars, entrepreneurs and policymakers, the specter of the same EE exerting differential impacts raises critical questions about the complex role of EEs in shaping entrepreneurial action. In this study, we extend these questions to address important gaps in our understanding of how EEs influence the rate of the single largest group of transitional entrepreneurs: women. Toward this end, our primary objective is to study how access to and use of ICTs differentially impacts the rates of female and male entrepreneurship by synthesizing key arguments from emerging theoretical work on the role of EEs in entrepreneurial action with related work on female entrepreneurship and the role of ICTs in facilitating entrepreneurial action.

2.1. *Entrepreneurship*

Research on entrepreneurship and transitions to entrepreneurship (Kerr, Kerr and Nanda, 2015) has revealed that the benefits associated with entrepreneurial action accumulate at

both the individual and the macro-economic level. Entrepreneurship often serves as an engine of economic growth and development (Minniti, 2010; Brush and Cooper, 2012). However, women are *less than half as likely* as men to start a new venture (GEM Report, 2018-19). Studies examining reasons for gender differences in entrepreneurial activity have isolated both micro and macro factors. At the *micro-level*, research has shown that men display stronger intentions to start new ventures (De Bruin *et al*., 2007; Yordanova and Tarrazon, 2010), while women appear to be more risk averse (Ackah *et al*., 2019), have higher fear of failure (Turro, Noguera and Urbano, 2020) and lower confidence in entrepreneurial self-efficacy (Dempsey and Jennings, 2014). Institutional and cultural factors, including prescribed social roles, further reduce the motivation of some women to start businesses (Manolova, Brush and Edelman, 2008).

Women face greater barriers in gaining access to financial resources (Edelman *et al*., 2018), partially as a consequence of the biased perceptions of would-be investors (Kanze *et al*., 2018). As a result, female entrepreneurs tend to start their ventures with less capital viz-a-viz their male counterparts, and primarily draw on personal sources (Kwapisz and Hechavarría, 2018). More limited funding leads to lower growth rates for the female-led ventures (Alsos *et al*., 2006). Finally, crucial decision-makers may interpret signals sent by entrepreneurs through gendered filters — which tends to put female entrepreneurs at a disadvantage (Alsos and Ljunggren, 2017).

Meanwhile, at the *macro-level*, studies suggest contextual factors such as gendered institutions affect individual attitudes toward entrepreneurship (Pathak, Goltz and Buche, 2013). Factors such as institutionally defined roles, traditional beliefs and socially embedded gender assumptions contribute to lower entrepreneurship rates for women (Billore *et al*., 2010; Muhammad *et al*., 2017). In a study of female entrepreneurs in Oman, Ghouse *et al.* (2019) find that women face problems in terms of access to government for business related needs. Estrin and Mickiewicz (2011) provide empirical evidence of lower levels of entrepreneurial activity among women because of gender discrimination, including the restrictions faced by women in mobility.

Although some studies have suggested women can mitigate or overcome some of these obstacles — for example by gaining support from other women (Greenberg and Mollick, 2017) — the lack of financial and social support remains prevalent, suggesting women still face many barriers to entrepreneurship (Panda, 2018). Overall, the social construction of gendered norms raises important questions about whether masculine conceptualizations of entrepreneurship as a profession (Marlow and Patton, 2005) unnecessarily influence career choices of women in different countries around the world (Bruni, Gherardi and Poggio, 2004).

2.2. *External enablers of entrepreneurial activity*

EEs were born from the desire to offer an alternative approach to two persistent debates in entrepreneurship research: (i) concerns regarding the efficacy of the opportunity construct; and (ii) ongoing rancor regarding the discovery or creation of opportunities. Davidsson (2015) defines EEs as the exogenous macro-environmental forces that influence the "rate,

extent and substance of entrepreneurial activity" (cf. Chen *et al*., 2020: 1). Davidsson, Recker and von Briel (2020: 313) identify seven primary types of EEs: "technological, regulatory, demographic, socio-cultural, macroeconomic, political and natural-environmental." They note that EEs can have a sudden onset, such as an earthquake, or a gradual, predictable onset, such as the multi-generational aging of a population. EEs highlight the "distinct, external circumstances that have the potential of playing an essential role in eliciting and/or enabling a variety of entrepreneurial endeavors by several (potential) actors" (Davidsson, 2015: 675). Because EEs gestate and materialize exogenously, as actor-independent factors, they are aggregate-level changes to an entrepreneurial environment, but with profoundly important positive and negative consequences at the micro-foundational level of entrepreneurial action and outcomes. The explicit nature of an EE's impact is dependent upon "spatial, temporal, sectoral and socio-demographic" characteristics (Chen *et al*., 2020: 3), as well as the cause-effect-defining mechanism and venture-stage role of a given EE (Davidsson *et al*., 2020). A refinement of the emerging EE framework is offered by Chen *et al*. (2020), who suggest the enabling effects can have heterogenous impacts; these impacts range in their intensity and magnitude on entrepreneurial activity. Thus, the impact of an EE is a function of the type, and agent and contextual characteristics (Chen *et al*., 2020).

In recent years, scholars have taken notable steps toward better describing and predicting the heterogeneous impacts of EEs across sectoral (Bennett, 2019), temporal, (Chen *et al*., 2020) and spatial (Chen *et al*., 2020) dimensions, including regional variations in entrepreneurship (Bennett, 2020; Fritsch and Storey, 2014). However, to date, differential impacts owing to socio-demographics has largely remained unexplored, despite its importance to scholars, practitioners and policymakers (Davidsson, Recker and von Briel, 2020).

2.3. *ICTs as an external enabler*

ICTs have been recognized as an important platform for entrepreneurship (Asongu *et al*., 2018) because they can increase access to resources, including financial and social capital (Cho *et al*., 2007), and are positively associated with the probability of transitioning to entrepreneurship (Barnett, Hu and Wang, 2019). Hence, ICTs, including the internet, are technological EEs (Davidsson *et al*., 2020).

Prior research suggests that although the internet is an enabling technology in certain cases (Bowen and Morris, 2019; Alderete, 2017), online environments can also exacerbate existing social inequalities based on gender (Dy, Marlow and Martin, 2017) or those inequalities stemming from geography, such as limited access and computer skills in rural environments. Although there is evidence that ICTs enhance certain types of economic activities (Heeks, 2010) that can result in higher rates of entrepreneurship (Asongu *et al*., 2018), including that among female entrepreneurs (Fuad *et al*., 2011), important questions remain unaddressed about whether access to ICTs enhance the broader social aims of female empowerment (e.g., see Walsham, 2012; Fuad *et al*., 2011; Mathew, 2010 for different perspectives).

Statistics compiled by Statista show that worldwide, 58.3 percent of men use the internet; however, the figure for women is only 48.4 percent. A variety of explanations for this disparity have been advanced. For example, gender-based differences in attitudes toward the internet, the level of computer anxiety (Durndell and Haag, 2002) and self-perceived technological skills (Hargittai and Shafer, 2006). Some scholars argue that "feminist politics and not technology per se" is the key to understanding stark differentials involving gender and technology (Wajcman, 2007: 287). In this view, technology represents an unfulfilled promise driven by "an unwarranted optimism about the liberating potential of technoscience for women" (Wajcman, 2007: 287).

At the same time, other feminist scholars argue that the advent of digital technologies should mitigate many of the socio-cultural challenges that arise with manufacturing and traditional service sectors (Fountain, 2000: 50):

> *"The economics and architecture of the Internet and World Wide Web enable disintermediation, allowing women in many cases to bypass traditional gatekeepers and power brokers. The Internet and World Wide Web provide an exceptional medium within which to expand and strengthen interconnections, linkages, and networks independent of distance rendering the coordination costs of organization by geographically dispersed women less burdensome. Finally, the capacity of information technologies to enable more flexible, family-friendly work arrangements may assist women to combine work and family in ways that offer new possibilities for professional career and social development."*

The disintermediation to which Fountain refers is transformational because it has the potential to anonymize the founder-owner's identity when doing so is commercially advantageous, or to accentuate an entrepreneur's identity when it is beneficial to approach the market with greater visibility. Depending on the value proposition and business model (Hunt and Ortiz-Hunt, 2017, 2018), a woman can theoretically compete through digital commerce on even footing for customers of cloud computing services, or perhaps at an advantage in attracting customers for high-visibility wellness products. The literature on crowdfunding appears to offer some support for this line of argument because research has shown that crowdfunding can reduce the barriers faced by women in tapping financial resources (Roig-Tierno *et al*., 2015). Gafni *et al*. (2020) show that female entrepreneurs have higher rates of success in crowdfunding campaigns compared to their male counterparts. Similar findings are reported by Ullah and Zhou (2020). However, other studies suggest that female-owned businesses are underrepresented in crowdfunding platforms (Malaga, Mamonov and Rosenblum, 2018) and that female founders raise lower amounts through crowdfunding (Vismara, 2016).

Overall, the role of ICTs as a type of digital EE is unclear, pointing to a complex set of factors that likely influence the extent to which ICTs facilitate the pursuit of gender parity in entrepreneurship. Although numerous scholars continue to hold out hope that ICTs will help women achieve parity with men in their ability to harvest the benefits of enablement (Mathew, 2010), supported in part by prior studies that have found positive and significant results (e.g., Martin and Wright, 2005), others point to the fact that women continue to fall behind in their efforts to reap the benefits of technology compared to men (Antonio

and Tuffley, 2014). For entrepreneurship scholars, these questions are critical to address as existing work suggest that ICTs are not neutral over "space, time and people" (Graham, 2002: 52). Unfortunately, there remains a paucity of empirical work in entrepreneurship literature at the intersection of ICTs and entrepreneurship theory, including the EE framework, to underscore the differences pertaining to socio-demographics. This leads to the unanswered question at the intersection of technology-based EEs and women's entrepreneurship. The ubiquity of the internet (Kim, 2018) as well as its aggregate socioeconomic impact (Clemons *et al*., 2017) makes it an ideal EE through which to explore the implications of technological innovation on the rate and extent of entrepreneurial action by women viz-a-viz their male counterparts.

3. Theory Development and Hypotheses

Our study investigates critical facets of two over-arching macro-trends: (i) the mercurial impact of technology in transforming commerce and society; and (ii) the evolving, expanding and increasingly entrepreneurial role of women in society. Despite the potency of these two transformational developments, the intersection between them has suffered from a lack of scholarly attention (Alsos, Hytti and Ljunggren, 2016). The lapse is not only indicative of the long-standing norms of viewing technological innovation through a masculine lens (McAdam, 2013; Marlow and McAdam, 2013), but also the broader tendency to treat "outgroup" populations—based on ethnicity, race, gender, age, tribe, religion, etc. — as being peripheral to socioeconomic growth and vibrancy (Lowry *et al*., 2010). The starting point of our work builds on emerging theory regarding the role of EEs in facilitating entrepreneurial action (Davidsson, 2015).

3.1. *Direct effect of EEs on entrepreneurship*

For many businesses, internet access is an important EE, providing a digital infrastructure for accessing important financial and commercial services, making it attractive for people to use this medium for entrepreneurship. Internet access also eliminates knowledge barriers (Townsend *et al*., 2018) by democratizing access to critical sources of information thereby spurring entrepreneurial activity (cf. Acs *et al*., 2009). Internet access directly and indirectly enhances the performance of SMEs (Ismail, Jeffery and Van Belle, 2011), extending the market reach and operational efficiency of SMEs, and facilitating access to the digital economy and overcoming limitations of local resource constraints (Dholakia and Kshetri, 2004). It also directly benefits SMEs by facilitating new venture formation (Colovic and Lamotte, 2015), increasing the rates of adoption and engagement in export activities (Hagsten and Kotnik, 2017). Internet access provides opportunities for SMEs to take advantage of new markets (Forster, 2000), providing access to global supply chains (Kaplan and Sawhney, 2000). The internet has been portrayed as a great equalizer, infiltrating almost every aspect of people's lives and opening up new avenues in career and education (Cai, Fan and Du, 2017), allowing even rural businesses to overcome local

constraints (Galloway, Sanders and Deakins, 2011) and to access the digital economy (Fountain, 2000). "The internet offers abundant means through which individuals can, and do, empower themselves, their groups, their causes and their countries. On the Internet, average citizens may find their voice more easily than they can in the offline world and can be heard much farther away" (Amichai-Hamburger *et al*., 2008: 1786; Friedman, 2005).

3.2. *Enabling impacts of ICT*

Internet access can lead to new entrepreneurial opportunities (Chandra and Leenders, 2012) and provides access to new niche markets (Martin and Matlay, 2003) through the promulgation of knowledge, education, financing and networks at the click of mouse, all of which has favorably influenced the creation of new ventures. Given these impacts, we expect that increasing levels of internet access directly increases entrepreneurial activity (Cumming and Johan, 2010). As a main effect, internet access as a force of enablement is expected to display a net-positive impact on entrepreneurship across a wide range of geographical contexts.

Hypothesis 1: *There is a positive relationship between the degree of internet access in a country and the level of aggregate entrepreneurial activity.*

3.3. *The gender-based contingencies of EEs*

Existing research has established the nature and extent of gender variation in entrepreneurial activity (Estrin and Mickiewicz, 2011). Often, gender gaps can be explained by the processes of economic development and cultural norms, owing to and exacerbated by favoritism toward males (Jayachandran, 2015; Mueller and Dato-On, 2008), as well as other deep-seeded cultural norms (Stephen and Pathak, 2016). These include informal institutions such as gender roles, which can limit women's entrepreneurial pursuits (Giménez and Calabrò, 2018), as well as formal, legal structures affecting entrepreneurship (Boettke and Coyne, 2009). In sum, research has shown that entrepreneurship rates are far from uniform across men and women (Murzacheva Sahasranamam and Levie, 2020), despite the fact the growth rate for female entrepreneurship has significantly exceeded that of men for more than a generation (Hunt and Ortiz-Hunt, 2017, 2018).

Existing scholarly work suggests gender stereotypes related to the use of technology affect women's ability to benefit from digital technologies, leading to a digital gender divide (Mariscal, Mayne, Aneja and Sorgner, 2019). Technology, being socially constructed, is considered to be gendered (Faulkner, 2001). As strong as the transformational impact of technology has been and will continue to be, the impediments facing female entrepreneurs remain formidable. As our literature review above has shown, women confront multiple forms of disadvantage compared to men, including institutional impediments (Hunt, 2013; Hunt and Ortiz-Hunt, 2017, 2018), higher fear of failure (Turro *et al*, 2020), lower educational attainment rates, primary responsibility for children (Aldrich *et al*., 1989), lack

of access to financial resources (Edelman *et al*., 2018; Marlow and Patton, 2005), weak to non-existent family support (De Vita *et al*., 2014) and differences in human capital (DeTienne and Chandler, 2007), among others. These barriers, which have historically placed many women at a disadvantage with respect to entrepreneurial pursuits, are likely to affect women's ability to leverage ICTs for entrepreneurial purposes as well.

Thus, despite the appealing notion of internet-assisted disintermediation (Fountain, 2000), whereby the internet allows women to bypass traditional gatekeepers and access resources through novel channels such as crowdsourcing platforms (Gafni *et al*., 2020; Roig-Tierno *et al*., 2015), there are numerous factors suggesting the benefits from technological EEs may be more limited for female entrepreneurs. Acknowledging that entrepreneurship is gendered (Mirchandani, 1999) because of the presence of socially constructed gender-stereotypes (Gupta *et al*., 2009), and the persistence of formal and informal institutions that affect men and women in profoundly different ways (Edelman *et al*., 2018), the *gendered* nature of entrepreneurship is likely to be more potent than the *enabling* qualities of internet access.

Based on these critical facets, we argue that the gendered nature of ICTs poses a disadvantage to female entrepreneurs viz-a-viz their male counterparts. Thus, although we predicted in Hypothesis 1 that the overall impact of the internet access as an external enabler would be a significantly net-positive, we expect that male entrepreneurs reap a disproportionately greater benefit from the internet's enablement than female entrepreneurs.

Hypothesis 2: *The positive relationship between the degree of internet access and the level of aggregate entrepreneurial activity is contingent upon gender-based differences among entrepreneurs such that the benefits of increased internet access will be disproportionately greater for men than for women.*

4. Data and Methods

4.1. *Data*

We combined archival data from multiple sources to test our hypotheses. First, we obtained data on entrepreneurial activity among male and female populations, as well as important country-level data on the broader entrepreneurial ecosystem, from the GEM project, specifically the Adult Population Survey (APS) and National Expert Survey (NES). The GEM project provides entrepreneurship measures across a wide range of countries. The GEM NES is based on primary data collected from the team of national experts in each country, on the national conditions that can impact entrepreneurship—Entrepreneurial Framework Conditions, whereas the GEM APS relies on primary data collected from the general population, with at least 2000 respondents in each country. We then obtained annual data on internet penetration and additional country-level control variables from the World Bank, specifically from the World Development Indicators (WDI) database and the Doing Business database. The analytical sample consists of an unbalanced panel of 61 countries, observed over a ten-year period (2004-2013). The sample countries are highly

diverse in terms of economic development, geography, political systems, as well as cultural and religious traditions (see Table A.1). Because entrepreneurial activity is reported separately for male and female populations in each country and each year, our data is structured in a country-gender-year format. After removing cases with missing data, the final sample consists of 604 country-gender-year observations.

4.2. *Dependent variable*

The dependent variable for our study is *Total Entrepreneurial Activity (TEA)* which is the percentage of adult working-age individuals (18 to 64 years old) who are engaged in early-stage[a] business venturing. As such, TEA is a reliable measure of country-level, aggregate business venturing activity (GEM, 2019). Because it is tracked over time and measured consistently across multiple countries, TEA is conducive to robust longitudinal macro-analyses of entrepreneurship and has been used extensively in prior research (Lee *et al*., 2020; Hechavarría and Ingram, 2019; Mohan *et al*., 2018).

4.3. *Independent variables*

Our model includes of two focal predictors: internet access and gender. *Internet access* is drawn from the World Bank's WDI database. It a continuous measure, ranging from 0-100 percent, and measures the percentage of individuals in a country who have access to the internet in any given year. *Gender* is a discrete dichotomous variable for the gender of each respondent included in the GEM APS survey. The variable is coded 1 for male and 0 for female. To test Hypothesis 2, which predicts that the internet has a stronger positive effect on entrepreneurship for men than for women, we also include an interaction term of *internet access* and *gender*.

4.4. *Control variables*

To isolate the effect of internet usage on TEA, we include a range of control variables. First, we control for *perceived opportunities*. Because past research has shown that the availability of opportunities influences the level of entrepreneurship in a country (McMullen, Bagby and Palich, 2008; Krueger and Dickson, 1994), this survey-based variable measures the extent to which entrepreneurial opportunities are perceived to be available in a country, using GEM NES data.

Second, because access to financing is often crucial for new ventures (Hechavarria and Ingram, 2019; Kerr and Nanda, 2009), we include the variable *equity*, which captures the availability of equity funding to new and growing firms. Considering the special role of Venture Capital (VC) in providing not just financing, but also non-monetary benefits like

[a]TEA combines nascent-stage entrepreneurs, who are in the process of starting a business, and later-stage entrepreneurs, who are running businesses that are older than three months but younger than 42 months (Reynolds *et al*., 2002).

advice and mentoring (Blevins and Ragozzino, 2018; Bertoni, Colombo and Grilli, 2011), we also control for the extent to which *VC funding* is easily available. Both *equity* and *VC funding* are survey-based measures drawn from the GEM NES.

Third, we include a set of control variables that capture the extent to which formal institutions and government policies support the founding and growth of new companies (Thai and Turkina, 2014; Branstetter *et al*., 2014). The variable *government policy and support* captures the extent to which the providing support for new and growing firms is considered a high priority in the national governmental policy (GEM Report). *Permits* measures the ease with which new firms can obtain any required licenses and permits. Because prior research suggests tax rate policies and tax structure influence the likelihood of individuals to engage in entrepreneurship (Belitski *et al*., 2016; Gurley-Calvez and Bruce, 2013), we add also the variable *Tax not a burden.* The three preceding measures are all drawn from the GEM data. To complement these measures, we also include the variable *score starting a business*, drawn from the World Bank's Doing Business dataset. *Score starting a business* is a composite indicator that measures different regulatory obstacles faced by entrepreneurs in starting a business, with a higher score indicating more efficient and streamlined procedures (World Bank, 2020).

Fourth, the level of entrepreneurship in an economy is also influenced by informal institutions, such as culture (Hechavarria *et al*., 2017; Liñán and Fernandez-Serrano, 2014). To control for the effect of *national culture*, we use a survey item from GEM NES, which captures the extent to which the national culture is perceived to encourage entrepreneurship.

Finally, to control for the impact of macro-economic conditions in an economy (Sussan and Acs, 2017), we add the variables *unemployment rate* and *GDP per capita growth rate*. Both are operationalized using WDI data.

5. Results

The descriptive statistics and correlations for all (unstandardized) variables are reported in Tables 1 and 2, respectively. Figure 1 presents a more detailed overview of our dependent variable, total entrepreneurial activity. The boxplot shows considerable variation of male and female TEA over time. Notably, the median TEA and the interquartile range of TEA are consistently lower for the female sample than for the male sample, suggesting female entrepreneurship rates lagged male entrepreneurship rates in most countries. In our view, this lends additional urgency to our goal of understanding potentially differential effects of EEs on men and women.

We used the fixed-effects estimator to understand the within-country effects of internet access on entrepreneurship rates. The result of the Hausman test was significant, suggesting the fixed-effects estimator is better suited than the random-effects estimator for our analysis because of the presence of unobserved heterogeneity across countries. Table 3 presents our main results from the regression analysis using fixed-effects estimator on TEA as the dependent variable. Model 1 includes only the main independent variable, *internet access*, whereas Model 2 includes only the control variables. Model 3 tests Hypothesis 1, i.e., the main effect of *internet access* on TEA. The coefficient of the independent variable *internet access* is

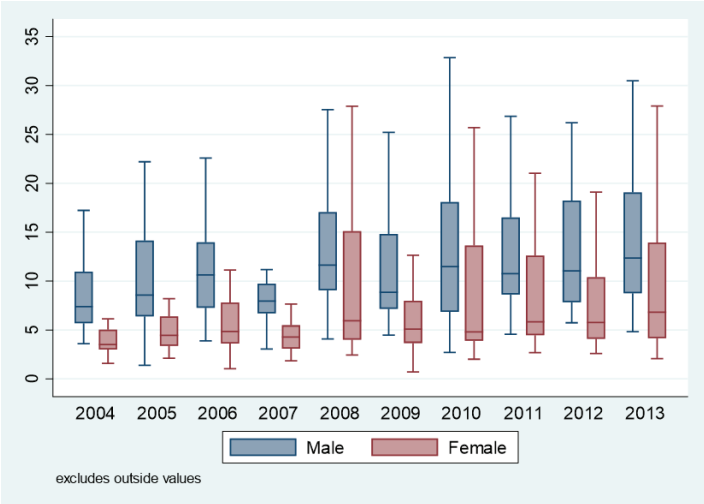

Figure 1. Box plot for the TEA Rates for Men and Women

Table 1. Descriptive statistics.

Variable	N	Mean	Std Dev	Min	Max
TEA	604	10.56	8.14	0.71	58.55
TEA – opportunity motive	604	7.49	5.61	0.50	37.67
Internet access	604	54.19	24.27	2.80	95.05
Perceived opportunities	604	3.54	0.43	2.19	4.36
Equity	604	2.65	0.49	1.41	4.33
VC funding	604	2.48	0.47	1.44	4.05
Government policy and support	604	2.83	0.56	1.58	4.89
Permits	604	2.06	0.63	1.08	4.42
Tax not a burden	604	2.45	0.59	1.35	4.39
National culture	604	2.45	0.48	1.58	4.28
Score starting a business	604	80.62	10.63	44.20	97.22
Unemployment rate	604	8.62	5.30	0.49	29.45
GDP growth rate	604	2.60	3.73	−14.24	11.89

positive and statistically significant ($\beta = 2.251$, $p < 0.01$), supporting Hypothesis 1. Model 4 is the full model, including controls, the independent variable *internet access*, and an interaction term between *internet access* and *gender*. The coefficient of the *internet* access remains positive and statistically significant ($\beta = 1.728$, $p = 0.042$), and that of the interaction term is also positive and marginally significant ($\beta = 1.047$, $p = 0.087$), which is consistent with

Table 2. Correlation matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) TEA	1.000					
(2) TEA – opportunity motive	0.966*	1.000				
(3) Internet access	–0.459*	–0.357*	1.000			
(4) Perceived opportunities	0.220*	0.229*	0.105*	1.000		
(5) Equity	–0.310*	–0.279*	0.148*	0.318*	1.000	
(6) VC funding	–0.351*	–0.295*	0.407*	0.296*	0.758*	1.000
(7) Government policy and support	–0.145*	0.109*	0.291*	0.361*	0.398*	0.413*
(8) Permits	–0.130*	–0.066*	0.521*	0.370*	0.176*	0.305*
(9) Tax not a burden	–0.162*	–0.094*	0.413*	0.350*	0.342*	0.382*
(10) National culture	0.196*	0.191*	–0.141*	0.390*	0.242*	0.197*
(11) Score starting a business	–0.310*	–0.226*	0.633*	0.208*	0.215*	0.444*
(12) Unemployment rate	–0.219*	–0.259*	–0.139*	0.246*	0.161*	–0.125*
(13) GDP growth rate	0.308*	0.296*	–0.370*	0.229*	0.077	0.045

*$p < 0.05$.

Table 2. (*Continued*). Correlation matrix.

Variable	(7)	(8)	(9)	(10)	(11)	(12)
(1) TEA						
(2) TEA – opportunity motive						
(3) Internet access						
(4) Perceived opportunities						
(5) Equity						
(6) VC funding						
(7) Government policy and support	1.000					
(8) Permits	0.530*	1.000				
(9) Tax not a burden	0.489*	0.528*	1.000			
(10) National culture	0.062	0.122*	0.150*	1.000		
(11) Score starting a business	0.302*	0.542*	0.205*	0.086*	1.000	
(12) Unemployment rate	0.022	–0.209*	–0.259*	–0.146*	–0.026	1.000
(13) GDP growth rate	–0.041	–0.065	–0.032	0.178*	–0.240*	–0.260*

Hypothesis 2. This suggests a one-standard-deviation increase in internet use in a country is associated with a 1.73 percentage point increase in *female* TEA, but a 2.78 percentage point increase in *male* TEA (1.73+1.047). Given that the mean TEA across all countries and years is around 10.5 percent, the effect sizes of *internet access* and the male-female differential are substantial. Overall, our econometric analysis supports our argument that external enablers such as internet access are not necessarily gender neutral.

Table 3. Fixed Effects estimates with TEA as dependent variable.

Model:	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Dependent variable:	TEA	TEA	TEA	TEA
Focal Predictor				
Internet access	2.524** (0.81)	—	2.251** (0.791)	1.728* (0.846)
Moderation effect (Male = 1)				
Internet access x Gender		—	—	1.047† (0.61)
Controls				
Perceived opportunities	—	0.418 (0.293)	0.429 (0.291)	0.43 (0.291)
Equity	—	–1.567*** (0.402)	–1.494*** (0.4)	–1.494*** (0.4)
VC funding	—	0.555 (0.472)	0.422 (0.47)	0.422 (0.47)
Government policy and support	—	1.206** (0.41)	1.139** (0.41)	1.139** (0.41)
Permits	—	1.166** (0.41)	1.048* (0.41)	1.05* (0.41)
Tax not a burden	—	–1.205** (0.442)	–1.074** (0.441)	–1.074* (0.44)
National culture	—	0.295 (0.462)	–0.233 (0.459)	–0.233 (0.458)
Score starting a business	—	–0.975** (0.385)	–1.04** (0.383)	–1.04** (0.381)
Unemployment rate	—	–1.16*** (0.226)	–1.185*** (0.313)	–1.185*** (0.312)
GDP growth rate	—	0.323 (0.226)	–0.324 (0.224)	–0.324 (0.223)
Constant	—	9.828*** (0.589)	11.27*** (0.774)	11.269*** (0.772)
Year dummies	Yes	Yes	Yes	Yes
F-statistic	4.95***	5.62***	5.82***	5.71***
R-squared	0.100	0.187	0.201	0.206
Chi-square statistic	22.89***	18.91***	16.08***	16.08***
Number of countries	61	61	61	61
Number of observations	604	604	604	604

Predictors and control variables are standardized. Standard errors are reported in parentheses.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < 0.1$.

5.1. *Robustness checks*

Because opportunity-driven and necessity-driven entrepreneurship may follow different patterns (Fairlie and Fossen, 2018; van der Zwan *et al*., 2016; Brünjes and Diez, 2013), we also conducted a robustness test with an alternative measure of entrepreneurial activity as the dependent variable: *Total Entrepreneurial Activity (opportunity motive).*This variable, which has been used in past studies to examine entrepreneurship (Aparicio, Urbano and Audretsch, 2016; Boudreaux and Nikolaev, 2018), is similar to our main dependent variable but includes *only* opportunity-driven entrepreneurship. Derived from the GEM APS dataset, this variable is measured as the percentage of population (18-64 years old) who are engaged in entrepreneurship because they are either driven by an opportunity to increase their income or to be independent, rather than just maintaining their income (Reynolds *et al*., 2005; GEM Report). Table 4 reports the results from the regression analysis using *Total Entrepreneurial Activity opportunity motive (TEA-O)* as the dependent variable. The results from this analysis (Table 4, models 5–8) are highly consistent with our main results; both hypotheses are supported (p <0.05 for both hypotheses).

6. Discussion

The EE framework examines how macro-environmental forces shape entrepreneurial actions and outcomes (Davidsson, 2015). In examining the impact of increasing internet access on the rates of entrepreneurship among women and men, we extend and enhance the EE framework by questioning the implicit assumption of gender-neutral enabling effects. Our study shows that some EEs, such as internet access, have differential effects on entrepreneurial activity among men and women. This finding holds across different country contexts in both the Global North and the Global South (Choudhury, 2009). In several supplementary analyses (not reported), we found no significant differences in the direction or magnitude of the effects across developed and developing countries, nor between different cultural contexts, suggesting that the internet acts as a *gendered* EE in many different settings. Internet access, as an EE, is characterized by high spatial and sectoral scope influencing entrepreneurial actionability (Davidsson *et al*., 2020) and is often portrayed as an important enabling technology to facilitate access to local and global markets (Porter, 2011). The results of our study confirm that internet access indeed does lead to higher levels of entrepreneurial activity (e.g., Arabiyat *et al*., 2019); however, they also crucially show this effect varies substantially by gender. The findings of our study suggest the existing gender gap in entrepreneurship can be accentuated further by ICTs. Below, we discuss the contributions of these findings for emerging theory.

6.2. *External enablers and entrepreneurial action*

The extent and manner of EE's influence upon aggregate rates of entrepreneurial activity remains largely exploratory (Bennett, 2019). Prior studies largely have demonstrated that demographic factors such as race, ethnicity, age, education and gender are important

Table 4. Robustness check-with TEA (opportunity motive) as dependent variable.

Model:	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Dependent variable:	TEA-O	TEA-O	TEA-O	TEA-O
Focal Predictor				
Internet access	1.512*** (0.247)	—	1.498*** (0.326)	0.993* (0.397)
Moderation effect (Male = 1)				
Internet access x Gender	—	—	—	1.012** (0.463)
Controls				
Perceived opportunities	—	0.169 (0.216)	0.083 (0.212)	0.083 (0.211)
Equity	—	–1.782*** (0.295)	–1.538*** (0.293)	–1.538*** (0.292)
VC funding	—	0.754* (0.351)	0.661† (0.344)	0.661† (0.343)
Government policy and support	—	1.051** (0.311)	0.942** (0.305)	0.942** (0.304)
Permits	—	0.96** (0.312)	0.777* (0.307)	0.777* (0.306)
Tax not a burden	—	–0.806* (0.333)	–0.706* (0.327)	–0.706* (0.326)
National culture	—	0.225 (0.348)	0.062 (0.343)	0.062 (0.342)
Score starting a business	—	0.268 (0.245)	–0.37 (0.277)	–0.37 (0.276)
Unemployment rate	—	–0.844*** (0.232)	–0.947*** (0.228)	–0.958*** (0.227)
GDP growth rate	—	0.126 (0.120)	0.2* (0.12)	0.2* (0.119)
Constant	7.374*** (0.094)	7.612*** (0.139)	7.467*** (0.14)	7.467*** (0.14)
F-statistic	37.56***	8.9***	10.36***	9.97***
R-squared	0.072	0.160	0.195	0.203
Chi-square statistic	22.77***	17.66***	17.00***	17.14***
Number of countries	61	61	61	61
Number of observations	604	604	604	604

Predictors and control variables are standardized. Standard errors are reported in parentheses.

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < 0.1$.

determinants of entrepreneurial activity (Gupta, Turban and Bhawe, 2008; Levie, 2007). What is less clear is how these demographic factors interact with EEs to shape entrepreneurial activity. Given the pronounced role of entrepreneurship in a country's economic growth and job creation (Acs and Szerb, 2007), and the increasing prominence of women

in fostering vibrant entrepreneurial ecosystems (Terjesen *et al*., 2016; Gargallo-Castel, Esteban-Salvador and Pérez-Sanz, 2010) a richer understanding of gender-based contingencies in shaping an EE's influence is important for further theorizing the EE framework as well as the development of useful, practical policy aims attendant to leveraging or mitigating EEs. The gender-based contingencies to internet connectivity indicate these particular forms of EE play a complex role in "enabling" entrepreneurship, appearing to exacerbate further the divide between male and female entrepreneurship. Davidsson (2015) suggested some EEs might be transient in nature. Although we show that the spread of the internet leads to the creation of new enterprises that did not previously exist, the fact we find some evidence of the contingent nature of EEs suggests that EEs should be studied holistically, taking into account the impact of macro-level mechanisms operating through EEs as well as the micro-level mechanisms operating through entrepreneurial action.

6.3. *Implications for policy and practice*

Empowering women, and thereby taking meaningful steps to address the marked gap in entrepreneurship rates between men and women, is also a subject of great interest to policymakers (Hughes *et al*., 2012). To this group our study offers several insights. In particular, we find that vital resources, such as internet access, may create widespread opportunities for entrepreneurial action and generate a high mean effect size. However, average impacts can be deceiving, and policymakers should be vigilant concerning gender disparities that may prevent equitable access to those opportunities. If a rising tide of EE-influenced opportunities favors one group over another, infrastructure investments intended to ameliorate systematic differences might actually perpetuate or even exacerbate existing gaps. Our results suggest that broad-based infrastructure investments should be augmented with the provision of education and training resources to help facilitate female entrepreneurship. We also find that EE impacts must be disaggregated to discover and address differential effects across socio-demographic sub-groups.

Institutions can play an important role in this regard. Specifically, we suggest policymakers take steps to make entrepreneurship more accessible to women by improving access to resources and by expanding family-oriented social services, such as childcare. To ensure women are aware of such policies, governments should devise mechanisms to spread awareness on the availability of institutional policies and support for female entrepreneurs. Acknowledging that changes need to happen at varying levels in the entrepreneurial ecosystem, we suggest policy should be aimed at removing the existing structural inefficiencies in the market. For example, governments could incentivize investments in female-owned ventures and simplify the procedures for setting up a business. The key policy implication of our study is that achieving gender parity in entrepreneurship would require a holistic approach; otherwise, policies intended to boost entrepreneurship may actually reinforce gender inequities because of existing cultural norms.

In providing implications for practice, we begin by providing insights for various stakeholders involved in entrepreneurship. At the regional levels, we suggest provision of capital for female-led businesses, assistance in business plan preparation and simplification of procedures for starting a business. We suggest the creation of incubators tailored for women's unique needs in the process of starting a venture. At the local levels, we suggest investments in training such that teachers have the recent technological competencies required to instruct the students. For educational institutions, we suggest technological competencies should be made a part of the curriculum at the primary and secondary levels. At the university level, we encourage programs focusing on technology and entrepreneurship to consider specific measures for strengthening their appeal to female students.

6.4. *Limitations and future research opportunities*

Although our study offers several important insights for emerging research on the role of EEs, several limitations in this study also open avenues for future research. First, our aim was to illustrate the gender-specific effects of EEs by using a single focal predictor—internet access. Much work remains to be done in examining which other important EEs might have gendered (or otherwise heterogeneous) effects. Future research could ask: Do EEs impact different demographic groups in different ways? Furthermore, we also acknowledge that men and women do not behave as homogenous groups. There are within-group variations within the broad gender categories we examine in this study. Future studies can build on our framework to examine the impact of factors such as race, ethnicity, age, religious beliefs of these groups to explore how these factors contribute to a differential response to EEs, and even conduct the analysis at the individual-level of analysis.

Second, further research is needed to investigate how different societal characteristics (such as gender norms and female empowerment) and varying levels of economic development shape the types of opportunities accessible to women through internet connectivity. We leverage a longitudinal within-country research design using a fixed-effects model to mitigate potential endogeneity issues. Although this research design has significant advantages with respect to endogeneity, it also limits our ability to compare effects across different levels of development, as countries' development levels are time-invariant in the short run (Reeb, Sakakibara and Mahmood, 2012). Future studies can employ research designs with larger samples, a wider range of countries and more fine-grained measures of economic, social and cultural factors.

Finally, the internet constitutes a dizzyingly dynamic environment for the emergence of new technologies. Rapid, evolutionary and revolutionary changes in technologies, business models and organizational forms require continual changes in government policies and the development of programs that aim to support business venturing by all the sub-groups comprising industries, markets and societies. The complexity of these processes often exceeds the ability of institutions to keep apace (Deeds *et al*., 2004). Emergent technologies are

likely to exert influence upon entrepreneurial activity in a manner that is quite different from that observed with established technologies and existing business models. Both enabling and constraining effects at different stages of technology's lifecycle (Hunt, 2013) may reveal distinctive impacts that vary as a consequence of the technology's temporal context (Hunt, 2012, 2018). This study offers an examination of the impacts arising from the influence of a very important, but very specific, instance of a technology-driven EE (i.e., internet access). Future research can assess the extent to which other technologies play a similar or dissimilar role as an EE in other sectoral, temporal and spatial contexts (Chen *et al*., 2020), including those that promulgate or mitigate differential rates of business venturing by gender.

7. Conclusion

We started our paper to address a specific question: *Do EEs differentially influence the prevalence of entrepreneurial activity among men and women*? The question is important to address for two specific reasons: (1) the gap between men and women's entrepreneurship rate still prevails, and (2) the complex role of EEs on entrepreneurship raises important questions about how EEs differentially impact different cohorts of entrepreneurs. This study addresses these questions by exploring how internet access as an EE influences entrepreneurial activity differently for men and women. Although prior research has suggested that ICTs can facilitate female entrepreneurship (Mathew, 2010), our study highlights the internet as a specific ICT and demonstrates that its effects are not uniformly experienced by men and women alike. Our key claim is that, in some cases, the positive effects of EEs can perpetuate important sources of social and economic inequality by compounding the challenges faced by female entrepreneurs in many societies. These results, in turn, raise important questions about whether these enabling effects of certain macro-structural forces can even turn into a set of "disabling" obstacles for certain cohorts of entrepreneurs.

Overall, this study conceptually and empirically advances the ongoing discussion concerning the role of EEs in stimulating entrepreneurial activity, while also opening the door for future research to examine the "disabling" effect of EEs, especially as that disablement is manifested among selected socio-demographic sub-groups. We hope this research will encourage critical discussions on the extent and substance of differential EE impacts. While research suggests that unfavorable macroeconomic conditions cause more severe hardship for women than for men (Thébaud and Sharkey, 2016), the findings of this study point to important gender-based contingencies associated with *positive* macroeconomic developments, and the complex role EEs play in advancing the broader social and economic goals of building more equitable societies.

Appendix A. Countries and Observation Numbers

Table A.1. List of countries and observation numbers.

#	Country	Number of Years	Number of Observations
1	Algeria	3	6
2	Angola	1	2
3	Argentina	9	18
4	Australia	3	6
5	Austria	3	6
6	Barbados	2	4
7	Belgium	7	14
8	Bolivia	1	2
9	Canada	3	6
10	Chile	9	18
11	Colombia	6	12
12	Costa Rica	2	4
13	Croatia	10	20
14	Czech Rep	3	6
15	Denmark	7	14
16	Ecuador	5	10
17	Finland	10	20
18	France	4	8
19	Germany	9	18
20	Ghana	2	4
21	Greece	10	20
22	Guatemala	3	6
23	Hungary	8	16
24	Iceland	5	10
25	Ireland	9	18
26	Israel	6	12
27	Italy	8	16
28	Jamaica	6	12
29	Kazakhstan	1	2
30	Latvia	7	14
31	Lithuania	3	6
32	Luxembourg	1	2

(*Continued*)

Table A.1. (*Continued*). List of countries and observation numbers.

#	Country	Number of Years	Number of Observations
33	Malawi	1	2
34	Malaysia	6	12
35	Montenegro	1	2
36	Netherlands	7	14
37	New Zealand	2	4
38	Norway	10	20
39	Panama	4	8
40	Peru	9	18
41	Philippines	2	4
42	Poland	4	8
43	Portugal	5	10
44	Puerto Rico	2	4
45	Romania	3	6
46	Saudi Arabia	2	4
47	Slovenia	10	20
48	South Africa	9	18
49	Spain	10	20
50	Suriname	1	2
51	Sweden	4	8
52	Switzerland	7	14
53	Thailand	5	10
54	Tunisia	3	6
55	Turkey	7	14
56	Uganda	3	6
57	UK	8	16
58	Uruguay	7	14
59	Vanuatu	1	2
60	Vietnam	1	2
61	Zambia	2	4
	Total	302	604

Note: There are two observations for each country-year because male and female entrepreneurship rates are reported separately.

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