Gender inequality and the entrepreneurial gender gap:
Evidence from 97 countries (2006–2017)

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Abstract
Although it seems almost a stylized fact that females are less likely than males to start new ventures, closing this gender gap is essential to foster sustainable economic growth. In this study, we analyze whether gender inequality, as measured at the country level by the World Economic Forum since 2006, is associated with the gender gap in entrepreneurship. By analyzing country-level information about gender inequality (97 countries) in combination with individual-level data from the Global Entrepreneurship Monitor (1,905,665 individuals) from the years 2006 to 2017, we find that in more gender equal countries involvement in total early-stage entrepreneurial activity (TEA) is higher. Gender inequality moderates the effect of gender on TEA, by almost closing the gender gap in entrepreneurship in the most gender equal countries. We show that gender inequalities in economic participation and opportunity as well as in political empowerment are the main drivers of this interaction effect. We find similar patterns when distinguishing between opportunity-driven and necessity-driven TEA. With opportunity-driven entrepreneurship as a potential vehicle for the economic empowerment of females, our study highlights the role of policies stimulating gender equality.

Keywords Entrepreneurship · Gender Gap · Gender Inequality · Global Entrepreneurship Monitor

JEL classification J16 · J24 · L26

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1 Introduction

The gender gap in entrepreneurship, usually proxied by the difference in the engagement in entrepreneurship between males and females (Global Entrepreneurship Monitor 2019), is a topic of prime interest among policymakers in both developed and developing countries (Foss et al. 2019). With the increasing contribution of female entrepreneurs to economic development (Brush and Brush 2006; Dean et al. 2019; Kevane and Wydick 2001), it is not only important to increase the participation of female entrepreneurs in mainstream entrepreneurial activities but also to lower barriers hindering their entrepreneurial success. Increasing the levels of female entrepreneurship may not only add the needed cognitive and human capital diversity to the entrepreneurial process but female-led startups and businesses lower unemployment and are known to contribute to economic growth (Hechavarria et al. 2019). The returns females derive from their businesses, especially in developing countries, could contribute to improved family support (Hundera et al. 2019; Kevane and Wydick 2001), and with females on average more directly involved in day-to-day family caretaking and support than males, entrepreneurship may provide them with additional resources to improve household outcomes such as child education and well-being. Starting a business may therefore improve the status and social standing of females and their households, and enhance the pursuit of self-realization goals (Carter et al. 2003; Manolova et al. 2008).

Despite the known benefits of female entrepreneurship, female-owned firms remain underrepresented, and entrepreneurship remains a male-dominated activity. Globally, the percentual engagement of females in the early stages of entrepreneurship is approximately three-quarters of this engagement of males. Moreover, female entrepreneurs are less likely to own established businesses than male entrepreneurs (Global Entrepreneurship Monitor 2019). The deadweight loss of the limited inclusion of female entrepreneurs highlights the importance of analyzing how gender inequality is associated with systematic distortions in the labor force participation of females and their engagement in entrepreneurship. The distortions catalyzed by gender inequality, in addition to institutional, social, and cultural factors, may systematically distort the structural characteristics of the working-age population in the entrepreneurial undertaking. Such structural differences induced by gender inequality may lead to less desired outcomes, including engagement of females in necessity (push-based) instead of opportunity (pull-based) entrepreneurship. However, the potential displacement loss from opportunity- to necessity-based entrepreneurship has so far remained relatively less explored.

In this study, we analyze whether country-level gender inequality, as measured by the World Economic Forum since 2006, is associated with the gender gap in opportunity and necessity entrepreneurship. Answering this research question helps to shed light on the possible double-whammy that females may face—lower engagement in entrepreneurship, and higher engagement in necessity-based entrepreneurship. By answering this research question, we respond to calls to developing a deeper understanding of female entrepreneurship (Brush and Cooper 2012; Dean et al. 2019; McAdam 2013). To examine the role of gender inequality on
differences in opportunity versus necessity-based entrepreneurship, we draw on the literature on female entrepreneurship.

Gender inequality through multiple modalities may influence how females perceive their abilities to start a business, develop an entrepreneurial mindset, navigate in the socio-economic and cultural environment, and develop relationships (McAdam 2013; Minniti 2009). In addition to regulations, gender inequality reinforces ascriptions and support for success in entrepreneurship. The ongoing and pervasive effects of gender inequality may therefore influence within- and between-national differences in the uptake of opportunity-driven versus necessity-based entrepreneurship.

Answering our research question is important, because, although several studies have indicated that the gender gap in entrepreneurship varies systematically across countries (Estrin and Mickiewicz 2011; Hechavarría and Ingram 2019; Ribes-Giner et al. 2018), gender inequality may also have a heterogeneous impact on the types of entrepreneurship. Gender inequality could introduce systematic distortions at multiple levels of an economic, social, and political system and may also influence individual perceptions of self-efficacy and skills for undertaking opportunity-based entrepreneurship. In addition, gender inequality could reinforce stereotypes and systemic biases that may further limit participation in opportunity-based entrepreneurship. Economic and regulatory conditions are indeed important, but gender inequality also has a deep impact on social and economic behaviors, and gender inequality is not limited to economically less developed countries (Gerecke 2013; Kalpazidou Schmidt and Cacace 2017). Therefore, by focusing not only on the involvement in entrepreneurship but also on the type of entrepreneurship, our study attempts to provide a more complete picture of the gender gap in entrepreneurship and is informative for the further research discourse on female entrepreneurship. If there are systematic differences between male and female entrepreneurs in opportunity-driven and necessity-based entrepreneurship, gender inequality will be an important driver that may further lower the individual, social, and economic benefits of female entrepreneurship.

Based on data from 97 countries (1,905,665 individuals) from the years 2006 to 2017, we provide evidence that gender inequality is associated with variations in both opportunity and necessity-based entrepreneurship, a gap that closes between males and females with increasing gender equality. The closing of the gap is indicative of the constraining factors that may limit females from considering, pursuing, and thriving in opportunity-based entrepreneurship in more gender unequal countries, because economic and political inequalities are the main drivers of the estimated interaction effects. Thus, rooted in internalized and ascribed roles and behaviors reinforced by gender inequality (Eagly 1997, 2009), our findings further add to our understanding of systematic variations in entrepreneurship between males and females.

The remainder of the paper is structured as follows. In Section 2, we develop hypotheses about how gender inequality influences involvement in entrepreneurship as well as how it moderates the relationship between gender and entrepreneurship. Thereafter, we describe the data and methodology in Section 3.
Section 4, we present the empirical results. Finally, in Section 5 we discuss the empirical findings and provide directions for future research and conclusions.

2 Theoretical background and hypotheses

In this section, we first review the literature about the relationship between gender inequality and entrepreneurship. This review in Section 2.1 leads to Hypothesis 1. In Section 2.2, we focus on the relationship between gender inequality and the motives behind engaging in entrepreneurship (opportunity-driven vs. necessity-driven). At the end of this section, we derive Hypotheses 2a and 2b.

2.1 Gender inequality and Entrepreneurship

While males and females differ only slightly in terms of intentions to start a business within the next three years, the engagement of females in early stage entrepreneurial activity is on average approximately only three-quarters of that by males (Global Entrepreneurship Monitor 2019). There are three main research streams explaining differences in entrepreneurial outcomes between males and females: personality and traits (Kerr et al. 2017); gender beliefs and ascriptions (Brush et al. 2009; Eagly 1997, 2009; Marlow and McAdam 2013); and contextual factors (Dheer et al. 2019). Research has found limited support for personality differences, affect, and trait factors as drivers of differences in entrepreneurial undertakings between males and females (Brush and Cooper 2012; Santos et al. 2018). However, gender beliefs and ascriptions shape a variety of entrepreneurial stages, as these beliefs and ascriptions form the cognitive basis of devising and executing entrepreneurial actions (Bullough et al. 2022). The variations in beliefs and images about entrepreneurship between males and females shape processes ranging from opportunity recognition (Orser et al. 2013) to funding (Balachandra et al. 2019) and from assessing entrepreneurial capabilities (Botha et al. 2006; Kobeissi 2010) to perceived self-actualization gains from entrepreneurship (Kariv 2013). Engaging in entrepreneurial behaviors, congruent with gender expectations and stereotypes, has led to differences in the type of industries in which males and females start their businesses (Dean et al. 2019). The third stream of research has focused on the role of country-level institutions (Estrin and Mickiewicz 2011) and the economic development stage of a country (Acs et al. 2011) to explain differences in entrepreneurial propensities between males and females. The additional country-level dimensions explaining differences in entrepreneurial propensity between males and females include cultural dimensions (Noguera et al. 2013), country-level leadership differences (Henry et al. 2015), and social institutions (Field et al. 2010).

In this study, we focus on gender inequality. Gender inequality is the social process by which males and females are not treated as equals, and it permeates social, economic, legal, and institutional spheres. At the socio-cultural level, variations in gendered linguistic structures explain differences in entrepreneurial activity by males and females. Socio-cultural factors imbue differences in gendered roles that
drive business ownership rates (Terrell and Troilo 2010). Gender inequality could deeply influence the aspirations and roles that may constrain the engagement of females in opportunity-based entrepreneurship. As a part of the cross-cultural cognitive models of new venture creation (Busenitz and Lau 1996), gender inequality not only creates systematic barriers to engagement and progress in entrepreneurship but may also have an impact on the information processing, internalized beliefs, and self-efficacy in starting a venture (Brush et al. 2009). Gender inequality could therefore constrain females in business venturing.

At the macro-level, gender inequality could shape cognitions and efficacy about venturing by reinforcing socialization and stratification by gender beliefs and roles. Gender beliefs and roles are important factors explaining engagement in entrepreneurship. Based on the social role theory-based meaning of gender (Dheer et al. 2019), the occupational roles are socially constructed and the resulting social stratifications imbue behavioral roles that may not encourage females to engage in entrepreneurship. For example, gender inequality may reinforce beliefs about feminine qualities of caring and nurturing, which may be in contrast with aggressive and goal-driven entrepreneurial pursuits (Eddleston and Powell 2012; Rao 2014). Due to these reinforcements in the social, cultural, and economic environments, females may increasingly perceive misfits with socially constructed entrepreneurial roles and ascriptions of entrepreneurial identities. Therefore, the increased perceptions of misfits may lower the propensity among females to engage in entrepreneurship under increasing gender inequality. This leads to our first hypothesis.

**Hypothesis 1**: Gender inequality moderates the negative relationship between gender (female) and involvement in entrepreneurship such that the gender gap is larger in countries with higher gender inequality.

### 2.2 Gender inequality and opportunity-driven vs. necessity-driven entrepreneurship

Individuals engage in entrepreneurship for economic and non-economic reasons, with both proximal (autonomy and income in the short-term) and distal (asset accumulation and self-actualization) goals (Carter et al. 2003; Sexton and Bowman 1985). Two broad types of entrepreneurship are opportunity-driven and necessity-driven entrepreneurship (Amit and Muller 1995; Hechavarria and Reynolds 2009; Reynolds 2005). Necessity-driven entrepreneurs are pushed into entrepreneurship due to limited options and a lack of alternative employment options. Opportunity-driven entrepreneurs are pulled into entrepreneurship due to the volitional choice to exploit opportunities. In short, opportunity entrepreneurship aims “to take advantage of a business opportunity”, whereas necessity entrepreneurship exists when there are “no better choices for work” (Bhola et al. 2006; Van der Zwan et al. 2016).

Engagement in necessity-driven or opportunity-driven entrepreneurship is partly influenced by structural factors such as economic and social conditions, and much of informal entrepreneurship in developing countries is driven by push-based factors whereas much of pull-based entrepreneurship occurs in more economically
developed nations (Global Entrepreneurship Monitor 2019). Still, interestingly, the prevalence of both types of entrepreneurship is positively correlated at the country-level (Valdez and Richardson 2013), possibly because entrepreneurs may be reluctant to report involvement in entrepreneurial activities out of necessity even if this would be a more accurate characterization of their motive than being opportunity-driven (Acs et al. 2008). Nevertheless, opportunity-driven and necessity-driven entrepreneurship have distinct opportunity loci, resource requirements, stakeholder interactions, and risk-return profiles. For example, individuals in push-based entrepreneurship generally require fewer resources, focus on smaller businesses, and are not likely to pursue growth. Some of them, the so-called dependent self-employed, are also heavily dependent on the firms for which they work (OECD 2000). Instead, those in pull-based entrepreneurship generally focus on business growth, require a larger resource base, and generally have larger businesses that require more intensive exchanges with stakeholders.

Estrin and Mickiewicz (2011) note that “women’s decision to enter into entrepreneurship will be more sensitive to contextual factors because the perceived opportunity cost is higher for them than for men” (p. 400). In terms of resource provisions, gender inequality may also influence the perceptions of resource providers and stakeholders. Uncertain cashflows and implicit biases towards females on their ability to manage a business, credit market discrimination (Bhola et al. 2006), funding bias (Balachandra et al. 2019), partnership challenges (Batjargal et al. 2019; Yetim 2008), and customer discrimination (Liu et al. 2020) are among the factors that may limit the provision of resources and relationships. Gender inequality permeating and cascading through multiple levels of institutional, social, and economic systems could increase such biases, further limiting the possibility for females to engage in opportunity-based entrepreneurship.

Related to potential psychological differences (Yoder and Kahn 2003), the perceived embeddedness and the need for inclusivity of the environment, including family needs, drive preferences for focus on aspirations and decisions that benefit the immediate filial and community needs. These preferences may shape affinity towards necessity-based over opportunity-based entrepreneurship. Gender inequality may also further exacerbate the emphasis on ego versus social goals, for males and females, respectively (Lortie et al. 2017). Ego goals are focused on materialism and goal pursuit, whereas social goals are driven by cooperation and solidarity. Under greater gender inequality, segregation by these values may increase such that opportunities and resources for pull-based entrepreneurship may be more strongly allocated towards males. The stereotypic roles are more salient in more gender unequal societies where females may be expected to accept a lower social status, making it harder for females to pursue pull-based entrepreneurship as social barriers may inhibit opportunity-based pursuit. Among the entrepreneurs, females in such societies may be more likely to choose necessity-based entrepreneurship that may meet the expectations of the social-cultural environment and they may be more likely to make do with resources available to them in such an environment.

Finally, opportunity-based entrepreneurship is also more likely to be present in the innovation space. Studies found support for negative gender stereotypes (Gupta et al. 2009) and female underrepresentation in founding teams (Ruef et al. 2003).
Furthermore, female entrepreneurs are likely to have poorer social networks in structure and composition, with females often excluded from networks of a powerful few (Yetim 2008). Female entrepreneurs are more likely to have networks of similar others (Greenberg and Mollick 2017), and this may limit engagement in opportunity-based entrepreneurship. Taking all these arguments together, we expect that females in more gender unequal societies are relatively more likely to engage in necessity-driven entrepreneurship than in opportunity-driven entrepreneurship:

**Hypothesis 2a:** Gender inequality moderates the negative relationship between gender and involvement in opportunity-driven entrepreneurship such that the gender gap is larger in countries with high gender inequality.

**Hypothesis 2b:** Gender inequality moderates the negative relationship between gender and involvement in necessity-driven entrepreneurship such that the gender gap is smaller in countries with high gender inequality.

### 3 Data and methodology

#### 3.1 Data sources

Gender inequality information for each country is obtained from the Global Gender Gap Reports of the World Economic Forum (WEF). These data are available on an annual basis since 2006 and are publicly shared via the World Bank. From the World Bank’s World Development Indicators, we also derive information about the Gross Domestic Product (GDP) per capita and the unemployment rate in a country. These variables are used as control variables in our models. The country-level information is merged with individual-level data from the publicly available Adult Population Surveys (APSs) of the Global Entrepreneurship Monitor (GEM). The APS is an annual survey administered to a representative sample of at least 2,000 adults in each participating country. For this study, we used data from the survey years 2006–2017 (2017 is the most recent publicly available dataset). For our analysis, we restrict the sample to individuals of the working age (18–64 years). This is a commonly used restriction in the entrepreneurship literature because the nature of engagement in the labor market changes after passing the retirement age.

#### 3.2 Measures

#### 3.2.1 Outcome variables

Our outcome variables are all binary measures for involvement in Total early-stage Entrepreneurial Activity (TEA). TEA is GEM’s key measure for new business creation and reflects whether or not an individual is in the process of starting a new firm (nascent entrepreneurship) and the stage directly after the start of a new firm (owning-managing a new firm not older than 42 months). Our first measure directly reflects this binary distinction \[1 = \text{In TEA}, \ 0 = \text{Not in TEA}\], while our second \[1 = \text{In
opportunity-driven TEA, 0 = Not in TEA] and third [1 = In necessity-driven TEA, 0 = Not in TEA] variable focuses on opportunity-driven and necessity-driven TEA (by excluding those with a necessity-driven and opportunity-driven motive from the TEA subsample, respectively). These motives are self-reported by the respondents and reflect whether new entrepreneurs were pushed into entrepreneurship because other options for work were absent or unsatisfactory (necessity-driven motive), or pulled into it to take advantage of a business opportunity (opportunity-driven).

3.2.2 Main explanatory variables

Our first main explanatory variable is taken from GEM and reflects self-reported gender (1 = Female, 0 = Male). Our second main explanatory variable is the Gender Gap Index (Overall) as constructed by the WEF. Since 2006, the WEF examines the gap between males and females in four categories. These categories are Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment. A country’s score for Economic Participation and Opportunity is based on indicators for female labor force participation, wage equality for similar work, the estimated earned income differential, the male to female ratio for legislators, senior officials, and managers, and the male to female ratio for professional and technical workers. The score for Educational Attainment is based on the literacy rate, enrolment in primary education, enrolment in secondary education, and enrolment in tertiary education. Health and Survival is determined by the sex ratio at birth and healthy life expectancy. Finally, Political Empowerment is the combined score for the percentage of females in the parliament, as well as in ministerial positions, and the number of years with a female head of the state in the last 50 years. For more detailed information, we refer to the Global Gender Gap Report of the WEF (World Economic Forum 2021). For each category, the lowest possible score is 0 (inequality) and the highest possible score is 1 (equality). The scores for the four categories are combined into the Gender Gap Index (Overall). The resulting score also ranges between 0 and 1. The Gender Gap Index (Overall) focuses on measuring gaps rather than levels, and it captures gaps in outcome variables rather than gaps in input variables. Importantly, the Gender Gap Index (Overall) ranks countries according to gender equality rather than females’ empowerment.

3.2.3 Control variables

In our analyses, we control at the individual level for a basic set of socio-demographic characteristics as available and consistently measured over the years in the GEM dataset. That is, we control for age in years as well as age in years squared to account for possible non-linearities, and the level of education (None; Some secondary, Secondary degree, Post-secondary, and Graduate). Moreover, because of the quadratic relationship between economic development and TEA (Wennekers et al. 2005), we control for (the logarithm of) GDP per capita (Constant 2017 international $) and GDP per capita squared. We also control for the unemployment rate in a country (percent of the total labor force), the year of the survey, and country dummies.
3.3 Methodology

For each dependent variable, we run two models. In the first model, the explanatory variables are the \textit{Gender Gap Index (Overall)}, gender, and the set of control variables. In the second model, we additionally include the interaction between the \textit{Gender Gap Index (Overall)} and gender. Logit models would be most natural to model our binary dependent variables but to enhance the interpretation of the interaction effects we employ linear probability models rather than logit regressions. This is not inappropriate, because the mean of the dependent variables is not too extreme (i.e., close to 0 or 1). Moreover, the linear model is more robust in our setting where we simultaneously include country and year dummies and use standard errors clustered by country-year combinations to control for the data collection design. For reasons of brevity, we do not explicitly report the coefficients for the country and year dummies in the tables. However, these are available upon request from the authors.

4 Results

After merging the datasets and casewise deletion of observations with missing data, our final sample includes 1,905,665 respondents of working age (18–64 years) from 97 countries in the years 2006 to 2017. The number of countries varies by year, from 38 in 2007 to 66 in 2013.

Table 1 presents the operationalization of variables, the data source for each variable, and descriptive statistics. Approximately 11 percent of the individuals in our sample are engaged in TEA, most of them (74%) being opportunity-driven. The proportions of females (51 percent) and males (49 percent) in the sample are approximately the same. The \textit{Gender Gap Index (Overall)} ranges between 0.46 (Yemen, 2009) and 0.85 (Finland and Norway, 2015) in our sample. On average, gender inequalities in \textit{Educational Attainment} (Mean = 0.98) and \textit{Health and Survival} (Mean = 0.97) are relatively small. Gender inequalities in \textit{Economic Participation and Opportunity} (Mean = 0.64) and \textit{Political Empowerment} (Mean = 0.23) are on average considerably larger across countries. The average age of individuals in the analysis sample is 39.87 years. With respect to educational attainment, most respondents in the sample (34 percent) hold a secondary degree. The mean level of GDP per capita is 15,882$ (constant 2017 international $) and the mean unemployment level (percent of the labor force) is 7.4 percent in the countries the respondents live.

In Table 2, we present the results of the linear probability models explaining involvement in TEA. In Column 1, we find that the \textit{Gender Gap Index (Overall)} is positively associated with involvement in TEA (i.e., TEA is on average higher in countries that are more gender equal) and that females are less likely than males to be engaged in TEA. That is, in Column 1, an increase of 0.10 in the \textit{Gender Gap Index (Overall)} is associated with an increase of 0.035, and being female is associated with a decrease of 0.038 in the likelihood of being engaged in TEA. Column 3 of Table 2 shows that the main effect of the \textit{Gender Gap Index (Overall)} is driven by the subdimensions \textit{Economic Participation and Opportunity}, \textit{Educational
Table 1 Descriptive statistics analysis sample ($N_{individuals} = 1,905,665; N_{countries} = 97$; Years 2006–2017)

|                       | Variable operationalization | Source       | Mean | S.D  | Min  | Max  |
|-----------------------|----------------------------|--------------|------|------|------|------|
| **Outcome variables** |                            |              |      |      |      |      |
| Total early-stage Entrepreneurial Activity (TEA) | $1 = Yes; 0 = No$ | GEM          | 0.109| 0.312| 0.000| 1.000|
| Opportunity-driven TEA ($N_{1,852,789}$) | $1 = Yes; 0 = No$ | GEM          | 0.080| 0.271| 0.000| 1.000|
| Necessity-driven TEA ($N_{1,757,521}$) | $1 = Yes; 0 = No$ | GEM          | 0.030| 0.171| 0.000| 1.000|
| **Main explanatory variables** |                            |              |      |      |      |      |
| Female | $1 = Female; 0 = Male$ | GEM          | 0.510| 0.500| 0.000| 1.000|
| Gender Gap Index (Overall) | $0–1$ | WEF          | 0.706| 0.053| 0.461| 0.850|
| Gender Gap Index (Economic Participation and Opportunity) | $0–1$ | WEF          | 0.640| 0.105| 0.233| 0.868|
| Gender Gap Index (Educational Attainment) | $0–1$ | WEF          | 0.982| 0.039| 0.615| 1.000|
| Gender Gap Index (Health and Survival) | $0–1$ | WEF          | 0.973| 0.009| 0.918| 0.980|
| Gender Gap Index (Political Empowerment) | $0–1$ | WEF          | 0.230| 0.133| 0.000| 0.675|
| **Control variables** |                            |              |      |      |      |      |
| Age | Years | GEM          | 39.879| 13.031| 18.000| 64.000|
| Education: None | None = 1; Other = 0 | GEM          | 0.087| 0.282| 0.000| 1.000|
| Education: Some secondary | Secondary secondary = 1; Other = 0 | GEM          | 0.200| 0.400| 0.000| 1.000|
| Education: Secondary degree | Secondary degree = 1; Other = 0 | GEM          | 0.340| 0.474| 0.000| 1.000|
| Education: Post-secondary | Post-secondary = 1; Other = 0 | GEM          | 0.287| 0.452| 0.000| 1.000|
| Education: Graduate | Graduate = 1; Other = 0 | GEM          | 0.086| 0.281| 0.000| 1.000|
| Gross Domestic Product (GDP) per capita (logarithm) | Constant 2017 international $ | WEF          | 9.673| 1.082| 5.966| 11.611|
| Unemployment rate (logarithm) | % of the labor force | WB            | 1.995| 0.715| -1.966| 3.519|

*GEM* Global Entrepreneurship Monitor, *WEF* World Economic Forum, *S.D.* Standard deviation, *Min.* Minimum, *Max.* Maximum
Table 2: Results of the linear probability models explaining involvement in Total early-stage Entrepreneurial Activity (Yes = 1; 0 = No)

| Model                                      | (1)       | (2)       | (3)       | (4)       |
|--------------------------------------------|-----------|-----------|-----------|-----------|
| Female                                     | -0.038*** | -0.142*** | -0.038*** | -0.053*** |
|                                            | (0.001)   | (0.019)   | (0.001)   | (0.105)   |
| Gender Gap Index (Overall)                 | 0.352***  | 0.277***  |           |           |
|                                            | (0.081)   | (0.083)   |           |           |
| Gender Gap Index (Overall) × Female        |           |           | 0.147***  |           |
|                                            |           |           | (0.026)   |           |
| Gender Gap Index (Economic Participation and Opportunity) |           |           | 0.097*   | 0.069     |
|                                            |           |           | (0.050)   | (0.051)   |
| Gender Gap Index (Economic Participation and Opportunity) × Female |           |           | 0.056*** |           |
|                                            |           |           | (0.014)   |           |
| Gender Gap Index (Educational Attainment)  | 0.330**   | 0.307**   |           |           |
|                                            | (0.128)   | (0.133)   |           |           |
| Gender Gap Index (Educational Attainment) × Female |           |           | 0.031    |           |
|                                            |           |           | (0.043)   |           |
| Gender Gap Index (Health and Survival)     | 0.048     | 0.066     |           |           |
|                                            | (0.413)   | (0.423)   |           |           |
| Gender Gap Index (Health and Survival) × Female |           |           | -0.059   |           |
|                                            |           |           | (0.103)   |           |
| Gender Gap Index (Political Empowerment)   | 0.070***  | 0.058**   |           |           |
|                                            | (0.023)   | (0.023)   |           |           |
| Gender Gap Index (Political Empowerment) × Female |           |           | 0.025**  |           |
|                                            |           |           | (0.010)   |           |
| Age                                        | 0.010***  | 0.010***  | 0.010***  | 0.010***  |
|                                            | (0.000)   | (0.000)   | (0.000)   | (0.000)   |
| Age squared                                | -0.000*** | -0.000*** | -0.000*** | -0.000*** |
|                                            | (0.000)   | (0.000)   | (0.000)   | (0.000)   |
| Education: Some secondary                  | 0.016***  | 0.015***  | 0.015***  | 0.015***  |
|                                            | (0.002)   | (0.002)   | (0.002)   | (0.002)   |
| Education: Secondary degree                | 0.022***  | 0.022***  | 0.022***  | 0.021***  |
|                                            | (0.002)   | (0.002)   | (0.002)   | (0.002)   |
| Education: Post-secondary                  | 0.038***  | 0.037***  | 0.038***  | 0.037***  |
|                                            | (0.003)   | (0.003)   | (0.003)   | (0.003)   |
| Education: Graduate                        | 0.050***  | 0.049***  | 0.050***  | 0.049***  |
|                                            | (0.003)   | (0.003)   | (0.003)   | (0.003)   |
| GDP per capita (logarithm)                 | -0.602*** | -0.596*** | -0.668*** | -0.661*** |
|                                            | (0.132)   | (0.133)   | (0.137)   | (0.138)   |
| GDP per capita (logarithm) squared         | 0.032***  | 0.032***  | 0.035***  | 0.035***  |
|                                            | (0.007)   | (0.007)   | (0.008)   | (0.008)   |
| Unemployment rate (logarithm)              | -0.013**  | -0.013**  | -0.016**  | -0.016**  |
|                                            | (0.006)   | (0.006)   | (0.006)   | (0.006)   |
| Year dummies                               | Included  | Included  | Included  | Included  |

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Attainment, and Political Empowerment of the Gender Gap Index (Overall). The regression coefficients for these three subdimensions are positive and significant, while the coefficient for the subdimension Health and Survival is insignificant.

In Column 2, the interaction term between the Gender Gap Index (Overall) and gender is added to the model. Here, as in Column 1, we also find that gender equality and involvement in TEA are positively associated while the opposite holds for the relationship between being female and TEA. Interestingly, Column 2 reveals that there is a significant interaction effect between the Gender Gap Index (Overall) and gender on TEA in the working age population. In this model, a change of 0.10 in the Gender Gap Index (Overall) is associated with an additional increase of 0.015 in the likelihood of being engaged in TEA for females as compared to males. A graphical representation of this interaction effect can be found in Fig. 1. Figure 1 shows that the gender gap in TEA becomes smaller in more gender equal countries. The gap is not fully closed, but the relative gap between the involvement in TEA by males and females becomes very small in the most gender equal countries (i.e., those countries scoring high on the Gender Gap Index (Overall); maximum score is 0.85, see Table 1). These results thus provide support for Hypothesis 1.

Column 4 shows that the main effects of the Gender Gap Index subdimensions remain all positive when interactions are added to the model. However, only the main effects for the subdimension Educational Attainment and Political Empowerment are significant. When looking at the interaction terms, we find that the interaction effect between the Gender Gap Index (Overall) and gender in Column 2 reflects the combination of a positive interaction effect for Economic Participation and Opportunity as well as for Political Empowerment. The coefficients for the interaction terms between the Gender Gap Index (Overall) on the one hand and Educational Attainment and Health and Survival on the other hand are insignificant.

The regression coefficient for Female is not significant in Column 4 of Table 2. The insignificance is driven by multicollinearity stemming from the inclusion of the four interaction terms in the model, especially the interaction term for the Gender Gap Index (Health and Survival) as there is relatively little variation across countries in the latter variable (cf. Table 1). For this reason, we analyzed model specifications in which we included each subdimension separately. Table 4 in the Appendix

Table 2 (continued)

|                      | (1)    | (2)    | (3)    | (4)    |
|----------------------|--------|--------|--------|--------|
| Country dummies      | Included | Included | Included | Included |
| Constant             | 2.531*** | 2.560*** | 2.684*** | 2.678*** |
|                      | (0.598) | (0.601) | (0.763) | (0.770) |
| $R^2$                | 0.062   | 0.063   | 0.062   | 0.063   |
| Individuals          | 1,905,665 | 1,905,665 | 1,905,665 | 1,905,665 |
| Countries            | 97      | 97      | 97      | 97      |

Standard errors in parentheses (clustered by country-year combinations); *** p<0.01, ** p<0.05, * p<0.10
shows that in these four models the coefficient for *Female* is negative and statistically significant except in the model for the *Gender Gap Index (Health and Survival)*. In model specifications with only the *Gender Gap Index (Economic Participation and Opportunity)*, the *Gender Gap Index (Educational Attainment)*, or the *Gender Gap Index (Political Empowerment)*, the regression coefficient for *Female* is negative and statistically significant. The inferences that can be drawn from this model are the same as the ones we draw based on Model 4 in Table 2.

Table 3 focuses on the involvement in opportunity-driven TEA (Columns 1–2), and necessity-driven TEA (Columns 3–4). In all four models, we find again that in more gender equal countries engagement in any type of TEA is higher. In all models, there is again broad agreement that females are less likely than males to be engaged in TEA. In line with Hypothesis 2a, we do observe that involvement in opportunity-driven TEA is significantly more likely for females when gender equality increases: The interaction term in Column 2 is significant. Here, a change of 0.10 in the *Gender Gap Index (Overall)* is associated with an additional increase of 0.008 in the likelihood of being engaged in opportunity-driven TEA for females as compared to males. Figure 2a visualizes the interaction effect.

However, against Hypothesis 2b, we observe a significant positive interaction effect between the *Gender Gap Index (Overall)* and gender in the model explaining necessity-driven TEA. Surprisingly, a change of 0.10 in the *Gender Gap Index (Overall)*...
(Overall) is associated with an additional increase of 0.009 in the likelihood of being engaged in necessity-driven TEA for females as compared to males. Figure 2b provides a graphical visualization of the estimated interaction effect. The likelihood of females engaging in necessity TEA even surpasses that of males in the most gender equal countries.
In Table 5 in the Appendix, we provide the results of a model explaining involvement in opportunity-driven TEA versus involvement in necessity-driven TEA. The results, which are visualized in Fig. 3 in the Appendix, interestingly show that while Female and the Gender Gap Index (Overall) are both negatively related to the involvement in opportunity-driven TEA (relative to necessity-driven TEA), we do not find statistical support that the relative difference between males and females closes when the Gender Gap Index (Overall) increases.

5 Discussion and conclusion

In this study, we set out to address the influence of gender inequality on engagement in entrepreneurship and the type of entrepreneurship pursued by females. First of all, we find that in countries with higher gender equality involvement in total early-stage entrepreneurial activity is higher and that across all countries females are less likely than males to be engaged in total early-stage entrepreneurship. Moreover, the moderation analyses show that the gender gap in entrepreneurship becomes significantly smaller when gender equality in a country increases.

To assess the robustness of our results against controlling for the quality of formal and informal institutions that may influence the availability of entrepreneurial opportunities, Table 6 in the Appendix reproduces the models in Table 2 while additionally controlling for the twelve Entrepreneurial Framework Conditions (EFCs) that are commonly used to capture the entrepreneurial ecosystem of a country and for which measures have been collected by the Global Entrepreneurship Monitor in a harmonized fashion (Global Entrepreneurship Monitor 2022). The inclusion of these twelve country-level variables reduces the sample somewhat, but our main inferences are not influenced by the inclusion of these variables. Therefore, we conclude that gender inequality is associated with the gender gap in entrepreneurship.
When distinguishing between opportunity-driven and necessity-driven entrepreneurship, we find that higher gender equality is also associated with a smaller gap in opportunity-driven entrepreneurship between males and females. Surprisingly, contrary to Hypothesis 2b, we find the same for necessity-driven entrepreneurship. We even find that in the most gender equal countries the predicted engagement in necessity-driven entrepreneurship of females is larger than that of males. Because of the relative sensitivity to contextual factors of the women’s decision to engage in entrepreneurship (Estrin and Mickiewicz 2011), we expected the gender gap in necessity-driven entrepreneurship to be smaller in gender unequal countries. Still, when taking into account the predicted prevalence of these two types of entrepreneurship, we find that in the most gender unequal countries the percentual difference in engagement between males and females is largest for opportunity-driven entrepreneurship.

Although our main analyses employ the Gender Gap Index (Overall), the subcomponents of this overall index provide a more detailed understanding of which type of inequalities policymakers can focus on to reduce gender inequalities in entrepreneurship. We find that, in particular, inequalities in economic participation and opportunity as well as in political empowerment are associated with the gender gap in entrepreneurship. Limited economic participation creates systematic distortions that increase structural constraints to the inclusion of females in the broader economic system, whereas economic participation and opportunity increase economic inclusion, lower discrimination, and allow females to consider economic channels as the mode for self-reliance and self-actualization. The participation of females in the political milieu not only gives them confidence and a voice in the political process, but provides a more equal standing in devising political narratives, policies, and reforms that favor the social and economic success of females. As such, political empowerment has cascading effects on the image, acceptance, status, and inclusion of females in the mainstream discourse of economic freedom and pursuit of opportunities, including entrepreneurship.

Together, these findings contribute to ongoing research on female entrepreneurship. Earlier studies already found that females are less likely to pursue entrepreneurship than males, and that female entrepreneurs realize lower income than male entrepreneurs (Brush and Brush 2006; Brush and Cooper 2012). A variety of factors at the macro-, meso-, and micro-levels have already been explored to explain this gap (Dean et al. 2019; Minniti 2009), and our study suggests that economic and political gender equality may empower female entrepreneurs. Moreover, we extend past work by Wennekers et al. (2005) and Baughn et al. (2006) who found no relationship between gender equality and female entrepreneurship at the country level. By drawing on individual-level data, we found that gender inequality does play an important role by influencing both engagement in total early-stage entrepreneurship and the type of entrepreneurship pursued.

Policymakers around the world and the Sustainable Development Goals of the United Nations focus on promoting entrepreneurship as a means to lower poverty (Apostolopoulos et al. 2018). Our results suggest that with females
driving the multiplier effect by using their entrepreneurship income towards family needs, the poverty alleviation from entrepreneurship may be limited by gender inequality. Therefore, our findings echo Amartya Sen’s (1995) observation of gender inequality as “the deeply unequal sharing of the burden of adversities between women and men” (p. 466). Gender inequality is a complex interconnection of social, cultural, and economic elements, and our findings allude to deeper concerns about gender inequality. Beyond the obvious social and individual level benefits of gender equality, the present findings point to the missed economic opportunities by limiting the participation of females in opportunity-driven entrepreneurship. Moreover, according to a recent report of the World Bank, gender equality is “smart economics” because it enhances productivity and improves outcomes for the next generation (World Bank 2012). Therefore, our findings call again for an improved focus on removing resource and opportunity barriers for females in higher gender unequal countries in particular by addressing stereotypes of who are entrepreneurs and what is entrepreneurship. (Global Entrepreneurship Monitor 2019).

Currently, the lower participation of females in entrepreneurship has significantly curtailed economic growth, and closing this gap between males and females could help unleash the overall economic potential of a nation. Although lowering the gender gap in entrepreneurship may be a no-brainer for policymakers, our findings also move beyond this consensus by pointing specifically to the importance of reducing inequalities in economic participation and opportunity as well as political empowerment. Based on the estimated effect sizes we expect that economic participation and opportunity would have the most impact on closing the gender gap in entrepreneurship. We do not find evidence that supports the role of inequalities in educational attainment as well as health and survival in reducing differential engagement of males and females in entrepreneurship. These results do not imply that further improvements in these dimensions should not be strived for, but may reflect that most countries score already very high on these two dimensions (cf. Table 1).

Despite drawing on large-scale data from 97 countries, this study is not without limitations. First, our study explores the proposed associations by focusing on country-level conditions and individual-level outcomes. Though consistent with a wide range of studies using a similar design to predict the effects of country-level characteristics on individual-level entrepreneurial choices, the precise intermediate mechanisms are not identified. The multifaceted and multicontextual nature of the effects of gender inequality call for a closer examination of this complex context of practical relevance. Moreover, our measure for gender inequality reflects the average situation in a country. There may nevertheless be variation in the extent females experience gender inequality within a country. This concern warrants future research examining perceived levels of gender inequality by female entrepreneurs, although it may not be easy to objectively measure such perceptions. Despite these concerns, future studies can build on the present findings to further assess how females in more gender unequal societies face greater challenges in organizing and managing ventures, especially opportunity-driven ventures.
### Appendix

**Table 4** Results of the linear probability models explaining involvement in Total early-stage Entrepreneurial Activity (Yes = 1; 0 = No)

|                      | (1)       | (2)       | (3)       | (4)       | (5)       |
|----------------------|-----------|-----------|-----------|-----------|-----------|
| Female               | -0.083*** | -0.143*** | -0.136    | -0.048*** | -0.106*** |
|                      | (0.009)   | (0.045)   | (0.118)   | (0.003)   | (0.041)   |
| Gender Gap Index (Overall) |          |           |           |           |           |
| Gender Gap Index (Overall) × Female |          |           |           |           |           |
| Gender Gap Index (Economic Participation and Opportunity) | 0.049    |           |           |           | 0.069     |
|                      | (0.051)   |           |           |           | (0.051)   |
| Gender Gap Index (Economic Participation and Opportunity) × Female | 0.069*** |           |           |           | 0.055***  |
|                      | (0.013)   |           |           |           | (0.014)   |
| Gender Gap Index (Educational Attainment) |           | 0.289**   |           | 0.311**   |           |
|                      |           | (0.136)   |           | (0.134)   |           |
| Gender Gap Index (Educational Attainment) × Female |           | 0.107**   |           | 0.027     |           |
|                      |           | (0.046)   |           | (0.043)   |           |
| Gender Gap Index (Health and Survival) |           |           | 0.325     |           |           |
|                      |           |           | (0.444)   |           |           |
| Gender Gap Index (Health and Survival) × Female |           |           | 0.100     |           |           |
|                      |           |           | (0.122)   |           |           |
| Gender Gap Index (Political Empowerment) |           |           |           | 0.053**   | 0.058**   |
|                      |           |           |           | (0.024)   | (0.023)   |
| Gender Gap Index (Political Empowerment) × Female |           |           |           | 0.040***  | 0.025**   |
|                      |           |           |           | (0.010)   | (0.010)   |
| Control variables    | Included  | Included  | Included  | Included  | Included  |
| Year dummies         | Included  | Included  | Included  | Included  | Included  |
Table 4 (continued)

|                  | (1)       | (2)       | (3)       | (4)       | (5)       |
|------------------|-----------|-----------|-----------|-----------|-----------|
| Country dummies  | Included  | Included  | Included  | Included  | Included  |
| Constant         | 2.421***  | 2.831***  | 2.216***  | 2.720***  | 2.744***  |
|                  | (0.651)   | (0.583)   | (0.800)   | (0.622)   | (0.596)   |
| $R^2$            | 0.062     | 0.062     | 0.062     | 0.062     | 0.063     |
| Individuals      | 1,905,665 | 1,905,665 | 1,905,665 | 1,905,665 | 1,905,665 |
| Countries        | 97        | 97        | 97        | 97        | 97        |

Standard errors in parentheses (clustered by country-year combinations); *** $p<0.01$, ** $p<0.05$, * $p<0.10$
Table 5 Results of the linear probability models explaining involvement in opportunity-driven vs. necessity-driven Total early-stage Entrepreneurial Activity (1 = Opportunity-driven TEA; 0 = Necessity-driven TEA)

|                      | (1)       | (2)       |
|----------------------|-----------|-----------|
| Female               | -0.055*** | -0.018    |
|                      | (0.003)   | (0.052)   |
| Gender Gap Index (Overall) | -0.603**  | -0.581**  |
|                      | (0.245)   | (0.245)   |
| Gender Gap Index (Overall) × Female | -0.053    | (0.073)   |
| Control variables    | Included  | Included  |
| Year dummies         | Included  | Included  |
| Country dummies      | Included  | Included  |
| Constant             | 2.122     | 2.108     |
|                      | (1.578)   | (1.579)   |
| $R^2$                | 201,020   | 201,020   |
| Individuals          | 0.069     | 0.069     |
| Countries            | 97        | 97        |

Standard errors in parentheses (clustered by country-year combinations); *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$
Table 6  Results of the linear probability models (including twelve control variables capturing the Entrepreneurial Framework Conditions in a country) explaining involvement in Total early-stage Entrepreneurial Activity (Yes = 1; 0 = No)

|                         | (1)       | (2)       | (3)       | (4)       |
|-------------------------|-----------|-----------|-----------|-----------|
| Female                  | -0.038*** | -0.140*** | -0.038*** | -0.002    |
|                         | (0.002)   | (0.020)   | (0.002)   | (0.114)   |
| Gender Gap Index (Overall) | 0.276***  | 0.203**   |           |           |
|                         | (0.079)   | (0.081)   |           |           |
| Gender Gap Index (Overall)×Female |           |           | 0.144***  |           |
|                         |           |           | (0.028)   |           |
| Gender Gap Index (Economic Participation and Opportunity) |           |           |           |           |
|                         |           |           | 0.048     | 0.019     |
|                         |           |           | (0.052)   | (0.052)   |
| Gender Gap Index (Economic Participation and Opportunity)×Female |           |           | 0.056***  |           |
|                         |           |           | (0.014)   |           |
| Gender Gap Index (Educational Attainment) |           |           | 0.350***  | 0.332**   |
|                         |           |           | (0.135)   | (0.141)   |
| Gender Gap Index (Educational Attainment)×Female |           |           | 0.022     |           |
|                         |           |           | (0.048)   |           |
| Gender Gap Index (Health and Survival) |           |           | 0.037     | 0.070     |
|                         |           |           | (0.483)   | (0.490)   |
| Gender Gap Index (Health and Survival)×Female |           |           | -0.102    |           |
|                         |           |           | (0.114)   |           |
| Gender Gap Index (Political Empowerment) |           |           | 0.058**   | 0.045*    |
|                         |           |           | (0.023)   | (0.023)   |
| Gender Gap Index (Political Empowerment)×Female |           |           | 0.026**   |           |
|                         |           |           | (0.011)   |           |
| Control variables       | Included  | Included  | Included  | Included  |
| Year dummies            | Included  | Included  | Included  | Included  |
| Country dummies         | Included  | Included  | Included  | Included  |
| Entrepreneurial Framework Conditions | Included  | Included  | Included  | Included  |
| Constant                | 2.030***  | 2.071***  | 2.245**   | 2.237**   |
|                         | (0.681)   | (0.683)   | (0.885)   | (0.890)   |
| R²                      | 0.063     | 0.063     | 0.063     | 0.063     |
| Individuals             | 1,794,074 | 1,794,074 | 1,794,074 | 1,794,074 |
| Countries               | 95        | 95        | 95        | 95        |

Standard errors in parentheses (clustered by country-year combinations); *** p < 0.01, ** p < 0.05, * p < 0.10
The data used in this study are publicly available (see Section 3.1).

**Declarations**

**Disclosure of potential conflicts of interest** The authors have no conflicts of interest to declare that are relevant to the content of this article.

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