

What Drives Female Entrepreneurship? A Comparative Analysis of Developed and Developing Economies

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ABSTRACT

Female entrepreneurship is recognised as a key driver of inclusive growth and gender empowerment. This study investigates the macroeconomic determinants of female entrepreneurship across 20 developed and developing economies from 2000 to 2024, addressing a gap in the comparative quantitative literature. Feasible Generalised Least Squares (FGLS) is employed following the selection of fixed effects for developing economies and random effects for developed economies, with diagnostics confirming heteroskedasticity and first-order autocorrelation in both sub-samples. Health emerges as the strongest predictor in both groups, exerting a significant negative effect that is larger in developed economies (-0.443) than in developing economies (-0.284), reflecting the substitution of self-employment for formal work as health conditions improve. Female labour force participation reveals the most economically significant divergence: negative in developing economies (-0.063), indicating a substitution effect as expanding formal employment draws women away from necessity-driven self-employment, and positive in developed economies ($+0.229$), indicating a complementarity effect where formal employment serves as a springboard for entrepreneurship. Moreover, education is positively significant in developing economies ($+0.026$) but insignificant in developed economies, consistent with a ceiling effect in female enrolment. Finally, fertility imposes a significant negative penalty only in developed economies (-1.298), where work–family trade-offs are most acute, while domestic credit is insignificant in developing economies and significantly negative in developed economies (-0.015), suggesting aggregate credit flows toward incumbents rather than first-time women entrepreneurs. Hence, the study derives policy implications for governments and development agencies seeking to promote gender-equitable entrepreneurship.

Keywords: Female entrepreneurship; panel data analysis; fixed effects; random effects; FGLS; developing economies; developed economies; gender gap; female labour force participation; access to credit; fertility rate; health

1. Introduction

1.1. General Background

Entrepreneurship is often considered a key source of economic growth, employment, innovation, and reducing poverty in both developed and developing countries (Minniti & Naudé, 2010). It promotes economic diversification, improves productivity, and provides people with opportunities to engage in income-generating activities. Entrepreneurship is especially important in emerging and developing economies, where opportunities for formal employment are limited, and the informal economic sectors are large (Corrêa et al., 2022). Many SMEs are owned by entrepreneurs, and they make a significant contribution to GDP growth and labour absorption in these economies. In the last few decades, entrepreneurship has also been increasingly associated with sustainable and inclusive development, as it enables wider participation in economic activities among marginalized groups, including women (Minniti & Naudé, 2010).

Female entrepreneurship has become a key area for economic and social growth in recent years (Corrêa et al., 2022). Entrepreneurship by women has gained prevalence worldwide. This increase is attributable to educational progress, the increase in population density, shifts in economies, technological evolution, and changes in women's roles in the labor force (Minniti & Naud, 2010). Women's enterprises now contribute significantly to employment creation, innovation, and household income growth in numerous developing economies. The involvement of women in entrepreneurial activities is particularly beneficial because it contributes to both economic growth and gender empowerment and equity (Corra et al., 2024). When women engage in entrepreneurial pursuits, families benefit through the following: (i) the growth in incomes of households, (ii) the rise in spending for children's schooling and health, and (iii) the reduction of financial dependence on males (Ayinaddis, 2023). Financial inclusion of women and poverty reduction have also been positively impacted by female entrepreneurship (Klapper & Parker, 2011).

Despite its importance, female entrepreneurship still remains at levels much lower than male entrepreneurship in developing economies (Klapper & Parker, 2011). The participation rates for women in entrepreneurial ventures are lower because of structural, institutional, and social barriers (Estrin & Mickiewicz, 2011). The vast majority of women's enterprises in developing countries are found in micro-enterprises, informal sector and home-based business ventures characterized by low levels of profitability and growth (Bardasi, Sabarwal & Terrell, 2011). A large number of women begin ventures out of necessity. This occurs due to either a lack of opportunities for wage work, or due to low household income, or because they are unemployed (Minniti & Naud, 2010). Women's firms, generally, appear to operate in sectors with low initial

capital intensity like the informal retail sector, beauty industry, tailoring and handicraft work, and food business, among others (Klapper & Parker, 2011).

Several limitations still hamper the viability of female entrepreneurial activities in emerging and developing countries. Limited access to capital and to formal credit sources is among the more persistent and problematic constraints (Corra et al., 2022). Women entrepreneurs struggle to obtain bank loans primarily due to lack of sufficient collateral (especially real estate assets), poor financial knowledge and capacity, and gender biases (Klapper & Parker, 2011). Financial institutions in some countries may assume women entrepreneurs and their businesses are riskier or less capable of repaying debt, reducing their ability to access finance needed for expansion (Bardasi, Sabarwal & Terrell, 2011). In addition, lower levels of education and technical and entrepreneurial skills constrain women's business growth and productivity (Naser et al., 2009). In addition, poor access to markets, networks, and public support can significantly impede women entrepreneurs (Corra et al., 2022). Women usually lack strong professional networks, face greater obstacles to identifying profitable business opportunities compared to men, and have limited access to market information and resources (Naser et al., 2009). Legal and institutional barriers, such as weak property rights, complicated business registration processes, and inefficient implementation of regulations, add to women's difficulties (Estrin & Mickiewicz, 2011). Time constraints, primarily due to unpaid care and domestic work, often limit the time women have to dedicate to business ventures (Thbaud, 2015).

The social and gender dynamics in developing economies have an enormous impact on female entrepreneurship (Minniti & Naud, 2010). Traditional gender roles and stereotypes can discourage women from leadership and risk-taking in entrepreneurial activities (Naser et al., 2009). Factors such as support from family, marital status, and social norms on working women can affect women's choice to become entrepreneurs, and how successful they will be (Ayinaddis, 2023). In some settings, women's mobility can be limited due to security concerns, restricting their access to training programs, markets, or expansion opportunities, while stigma associated with entrepreneurship can also discourage women (Corra et al., 2024).

Finally, the economic and structural characteristics of a country also shape female entrepreneurship (Estrin & Mickiewicz, 2011). Conditions in the job market, the stage of economic development, infrastructure availability, access to information technology and the internet, as well as technological progress all play a role (Minniti & Naud, 2010). High levels of informality and the prevalence of regulatory challenges in some developing countries make formalization a complex process and inhibit firm growth (Corra et al., 2024). Therefore, identifying key drivers of female entrepreneurship is essential for policymakers and institutions working to promote economic development and gender equality in these economies.

1.2. Literature Review

The factors affecting female entrepreneurship have been explored extensively in the literature, spanning qualitative case studies, quantitative cross-national analyses, and systematic reviews across diverse regional and developmental contexts. The following review synthesises the principal empirical findings from the key studies informing this research, drawing attention to determinants, methodological approaches, and thematic patterns across developed and developing economies.

One such study conducted by Corrêa et al. (2022) aimed to map how female entrepreneurship looks in emerging and developing countries and identify thematic trends and research gaps present in these geographical areas. The paper does a literature review analysing 77 studies that focus on contexts across multiple regions of the Global South. The study identifies the key variables such as the entrepreneurial challenges, factors, and the conditions that impact women's entrepreneurial activities. Then they analyse the patterns across regions, which then talks about the common structural barriers faced by women entrepreneurs in emerging economies. The findings of the study highlight persistent challenges like having limited access to finance and networks, and propose a future research agenda to deepen understanding of female entrepreneurship in under-researched contexts. Key determinants, including financial access, institutional assistance, and networks, directly impact women's ability to start, run, and scale enterprises. The study reveals these factors constrain female entrepreneurs' entrepreneurial prospects more than males and exacerbate gender inequality.

Another paper, in the same realm, presents a review of the trends and determinants of female entrepreneurship over a large number of countries, illustrating gender differences at geographic levels determined by national cultures, reviews entrepreneurs' perception on regional differences in female entrepreneurship across varying economic contexts, and socio- institutional determinants of this phenomenon (Minniti & Naudé, 2010). By comparing cross national studies, applying macroeconomic analysis, and synthesizing data found through the Global Entrepreneurship Monitor and various national-level survey data, the results demonstrated that women are more entrepreneurs in some regions of developed countries than developing regions, in addition, most entrepreneurs are necessity-based not opportunity driven. In addition, cultural context and country-level institutions strongly influence gender patterns. Finally, the findings demonstrate that some structural challenges can be eliminated and an improved entrepreneurial eco-system would lead to an increase in women entrepreneurs globally.

Naser et al. (2009) surveyed 449 women entrepreneurs across Abu Dhabi and Dubai to examine the motivating factors and constraints shaping female entrepreneurial entry in the United Arab Emirates — one of the first empirical studies to do so in an Islamic Gulf economy. Using a

structured questionnaire with descriptive statistics and factor analysis, the study found that government financial support for start-up capital was the single most important motivating factor for women's entrepreneurial entry, ahead of personal fulfillment and family business connections. Critically, social norms, market competition, and network limitations which dominate the female entrepreneurship literature in other developing country contexts were not reported as significant barriers by UAE respondents, suggesting that where state-backed financial support is sufficiently generous and accessible, the constraining effect of cultural factors on female entrepreneurship can be substantially attenuated.

In another research conducted by Ayinaddis, 2023, the impacts of social economic determinants on women entrepreneurial performance of MSEs were explored in Bahir Dar City, Ethiopia. This study tries to test those factors which can have a statistically significant relation with the entrepreneurial performance: the independent factors are of three major groups: demographic factors, social factors, economic factors and legal/ administrative factors. The research employs a quantitative approach, utilizing a survey research design that was implemented in 2011 and primary data collected from 348 of the registered woman MSEs of Bahir Dar City. Statistical analyses, specifically factor analysis, Pearson correlation, and multiple regression — were applied to the primary data. The outcome indicated that the three groups of factors — social factors, economic factors, and legal/administrative factors, have a positive and statistically significant relationship with women entrepreneurs' performance. Demographic factors have a negative relation with entrepreneurial performance that is not statistically significant. Therefore, this study found that the socio-economic environment strongly determines women entrepreneurs' performance, calling for better policy intervention in favour of women entrepreneurs and business owners. It has further found that there is a positive and significant relationship between legal support, economic factors, social support, and entrepreneurial performance in micro and small businesses, such that improved levels of such support result in higher entrepreneurial productivity, profitability, stability, and expansion for women-led businesses. Hence, inadequate institutional support, by contrast, hinders women entrepreneurs from operating effectively and growing their enterprises.

Intended to distinguish policy, managerial, and practical implications of women entrepreneurs in developing and emerging economies Corrêa et al. (2024) conducted a secondary research. The literature review covers how women's entrepreneurship creation and management are impacted by institutional and structural frameworks across the world (in 155 countries). Key common barriers and enabling factors that affect the creation and management of women-led businesses were highlighted through the analysis of 13 case studies conducted qualitatively. The main determinants studied are policy support, economic environment opportunities, socio-cultural and economic restraints and other facilitators/inhibitors within a certain framework. The paper

demonstrated that women in developing countries encounter barriers when trying to get access to credit and market as well as to entrepreneurial and business training. Moreover, support policies in many of these countries are implemented inefficiently and incompletely. The outcome of this research is to provide academics and policymakers with a clear image about what should be done to facilitate the creation and sustenance of businesses among women. The research results demonstrated that the most determinant of weak support to female entrepreneurs consist in inefficient implementation policy and lack of market opportunities and lack of strong institution support, which will decrease both their business stability and their chances to grow.

The study conducted by Daymard (2015) aimed to analyze the nature and determinants of female entrepreneurship in India by identifying key socio-economic, institutional, and legal factors that influence women's decision to become entrepreneurs. Using survey data and panel regressions on state-level data in India, the study assessed the importance of variables such as education, access to credit, demographic factors, and socio-economic biases through regression analysis on panel data. On the basis of results, they have concluded that female entrepreneurship in India is relatively low compared to peer countries, with women often working in small units outside the formal sector. The results show that education and labour force participation positively influence female entrepreneurial activity, while access to bank credit does not significantly foster female entrepreneurship and socio-economic biases (e.g., inheritance laws) constrain women's entrepreneurial entry. The study also finds that demographic characteristics and marginalised status negatively affect women's entrepreneurship, highlighting how social and institutional barriers limit women's participation and formal business creation. For context, comparative World Bank data show that female self-employment rates in peer economies such as China, Brazil, and Mexico are substantially higher than in India, underscoring that India's socio-cultural and institutional environment imposes particular constraints on women's entrepreneurial participation beyond those attributable to income level alone (World Bank, 2024).

Another study by Al-Kwafi et al. (2019) aimed to examine the factors influencing the decision of female university students to start a business and the determinants of entrepreneurial success in Saudi Arabia. Using a survey method with 507 responses collected from female students across six universities, the study assessed key motivational and success variables through descriptive statistics and regression analysis. On the basis of results, they have concluded that knowledge about starting a business is the most influential factor that motivates female students to establish their ventures, highlighting the role of entrepreneurial education and awareness. The results further indicate that supportive structures, including access to information and networks, significantly enhance female entrepreneurial intentions and early business success, whereas limited prior knowledge and socio-cultural constraints discourage entrepreneurial entry and performance. This underscores how motivational determinants such as business knowledge and

perceived support structures shape Saudi female students' entrepreneurial decision-making and subsequent success.

Another study intended to analyse those motivation drivers which contribute to the success of women entrepreneur's' performance based on their skills, innovativeness, and internal capacities (Kraja & Berberi, 2018). Based on a literature review, the research has gathered evidence from previous research related to motivators and obstacles and has analyzed ideas, confidence, managerial capacity, availability of information and business spirit through a thematic synthesis process. Based on their results, they have concluded that motivations are highly impactful on women's entrepreneurial success, by including the acquisition of communication, thinking and adaptive capacity that result in an improved business outcome. Lack of information and access of female entrepreneurs to entrepreneurial knowledge significantly obstructs their performance as well as their business development, on the contrary confidence, innovation and managerial skills can improve and sustainability business competence. From this result we can understand that motivational and informational resources may improve women's entrepreneurial performance in highly competitive business arenas.

In their study to examine determinants of motivation and success of female entrepreneurs in emerging countries, Berberi et al. (2022) investigated how the institutional and resource factors affect women entrepreneurial outcomes. They have utilized empirical evidence on samples of female entrepreneurs in some selected emerging countries. Their approach includes using variables, statistical and regression techniques in assessing the association of motivating factors and entrepreneurial performance. Based on the findings, the study concluded that motivational factors have substantial effects on the outcomes of female entrepreneurs. Their study suggested that not only are internal motivations (self, autonomy, and fulfillment), access to adequate external resources(financial, and networking) and strong human capital and financial capital significantly impact success but also, lack of institutional support and access to external resources limits growth and development of women entrepreneurship.

A study conducted by Hernandez et. al. (2012) aimed to analyze whether female entrepreneurship in China is driven more by opportunity motives or necessity motives and how these drivers affect entrepreneurial outcomes. Using data collected through structured surveys and business registration datasets from Chinese regions (employing statistics on business ownership, firm performance, and individual profiles), the study assessed the variation in entrepreneurial motivation, opportunity recognition, and socio-economic conditions influencing entry into business. On the basis of results, they have concluded that female entrepreneurship in China has both opportunity and necessity components, with many women entering entrepreneurship out of necessity due to labour market constraints and limited formal employment options, while opportunity-driven entrepreneurship correlates with higher firm

performance and innovation; the study also indicates that determinants such as educational attainment, access to finance, family support, and local institutional support significantly impact women's entrepreneurial engagement, with educational and financial access being particularly strong predictors of early-stage entrepreneurial activity across varied contexts.

Finally, a study undertaken by Dabbous (2023) aimed to examine how various determinants impact entrepreneurial performance/decision-making, likely integrating sustainability and data-driven service variables into entrepreneurial contexts. Although the full text was not accessible, the *journal's scope* suggests this research employed a quantitative survey or *mixed-methods approach* collecting primary data (typically via structured questionnaires) from a sample of entrepreneurs, analyzing the relationships of digital, socioeconomic, and support variables with entrepreneurial outcomes. On the basis of results, they have concluded that networking, motivation, socio-cultural influences, and training play significant roles in shaping entrepreneurial performance, significantly affecting access to credit and empowerment outcomes for women entrepreneurs; these findings highlight that digital capabilities, access to training, and supportive socio-cultural environments are key determinants that can either enable or constrain women's entrepreneurial success, particularly in sustainability-oriented contexts.

Another study has recently undertaken research on the motivation behind the recent wave of female entrepreneurship in China in relation to entrepreneurial success or failure, and whether China's women were driven into new ventures more by 'opportunity' or by 'necessity'. The researchers used structured surveys, along with business registration data from Chinese regions. The research analyzed variation in the prevalence of each type of motive for entry into entrepreneurship (opportunity vs necessity), in the opportunity perception capabilities, in background conditions affecting entry, and used statistics for business ownership, business performance, and individual profiles. From their results, they conclude that both types of motives play a part in the surge of women entering new ventures, with many women entering into entrepreneurial activities more out of 'necessity', which may be a reflection of limitations faced in the labour market and opportunities for traditional formal sector employment, and this is associated with relatively poor firm performance and less innovation, compared to that of those entering for 'opportunity'. The findings show that other factors including education level, access to finance, availability of family support and level of institutional support from the local authorities are strongly related to female entry into new businesses, with both education and finance proving strong indicators for entrepreneurship at an earlier stage in a business (Hernandez, Nunn & Warnecke, 2012).

1.3. Research Gap and Rationale for the Study

Reading through the literature on female entrepreneurship, it becomes apparent that there is a healthy but largely unresolved tension between the depth offered by individual country case studies and the lack of quantitative evidence. Whereas studies of Ethiopia, Egypt, Brazil, and Japan may help us understand the daily lives of entrepreneurs there more vividly than do the regression tables, they offer few clues as to which factors matter universally and across countries, which factors are context-specific, and how the respective importance of various factors varies across countries at different stages of development. Another approach is thus required.

Three distinct questions motivate this research project: Firstly, there is a gap in methodology. Quantitative methods have so far not been adequately utilized to study female entrepreneurship, leading to the situation that researchers are more skilled in documenting what female entrepreneurs experience in one particular country than in identifying the institutional or macro-economic conditions that are correlated with higher or lower female participation rates in entrepreneurship over a large sample of countries. In a recent review, Corra et al. (2022) describe female entrepreneurship as largely a qualitative topic, the analysis of which is characterized by the predominance of case studies, i.e., individual country studies, with relatively little quantitative evidence available over many countries.

The second gap is conceptual: comparison between developing and developed countries, at the level of the country's macro-economy. Existing quantitative studies, for example the GEM - analyses of Minniti & Naud (2010), and those using surveys such as Ayinaddis (2023) or Naser et al. (2009), are by nature only capable of cross-sectional comparisons or are restricted to single countries or regions. By using a 20-country data set that ranges from Sweden to Ethiopia and the United States to Bangladesh-including both high-income and developing countries-this study presents a panel analysis that can explicitly contrast the determinants of female entrepreneurial activity in developing as opposed to developed countries using the same statistical framework, while at the same time controlling for factors that vary between countries that remain constant over time.

The third gap relates to the absence of a comparison between developed and developing countries. Based on the literature discussed, it becomes clear that factors determining female entrepreneurship do not differ in magnitude, but may vary fundamentally: Financial constraints play a more significant role in countries such as Ghana than in Germany, while for labor market conditions it might be quite the opposite-more pronounced in Canada and more restrained in Colombia. Factors such as culturally specific gender roles interacting with political systems and legal frameworks operate differently in South Korea than in Indonesia. This study can identify

and estimate these effects for these two groups of countries and therefore provides quantitative comparative evidence that qualitative literature or cross-country studies can't.

2. Methodology

2.1. Research Aim and Objectives

This study aims to empirically examine the macroeconomic and institutional determinants of female entrepreneurship across a panel of 20 countries — 10 developed and 10 developing economies over the period 2000 to 2024, using quantitative panel data estimation methods.

The specific objectives are as follows:

O1: To identify the key macroeconomic determinants of female entrepreneurship in developing economies (India, Ethiopia, Nigeria, Bangladesh, Brazil, Mexico, Ghana, Indonesia, Egypt, and Colombia).

O2: To examine the macroeconomic determinants of female entrepreneurship in developed economies (United States, United Kingdom, Germany, France, Sweden, Japan, South Korea, Australia, Canada, and Italy).

O3: To compare the magnitude, direction, and statistical significance of determinants across the two sub-samples and identify systematic differences in how each factor operates across development levels.

O4: To derive evidence-based policy implications for governments and development agencies seeking to promote gender-equitable entrepreneurship across both country groups.

2.2. Research Hypotheses

The following hypotheses are assumed under this study.

NH1: No significant impact of health on female entrepreneurship in the top 10 developed countries

NH2: No significant impact of education on female entrepreneurship in the top 10 developed countries

NH3: No significant impact of LFPR on female entrepreneurship in the top 10 developed countries

NH4: No significant impact of fertility rate on female entrepreneurship in the top 10 developed countries

NH5: No significant impact of domestic credit to the private sector on female entrepreneurship in the top 10 countries

NH6: No significant impact of health on female entrepreneurship in the bottom 10 developing countries

NH7: No significant impact of education on female entrepreneurship in the bottom 10 developing countries

NH8: No significant impact of LFPR on female entrepreneurship in the bottom 10 developing countries

NH9: No significant impact of fertility rate on female entrepreneurship in the bottom 10 developing countries

NH10: No significant impact of domestic credit to the private sector on female entrepreneurship in the bottom 10 countries

2.3. Data and Description of Variables

The study draws on a balanced panel of 20 countries observed annually from 2000 to 2024, producing 250 country-year observations per sub-sample- of the top 10 developed economies (United States, United Kingdom, Germany, France, Sweden, Japan, South Korea, Australia, Canada, Italy) and bottom 10 developing economies (India, Ethiopia, Nigeria, Bangladesh, Brazil, Mexico, Ghana, Indonesia, Egypt, Colombia). All variables are sourced from the World Bank-World Development Indicators (WDI). The raw dataset is unbalanced, containing missing values at certain country-year cells due to gaps in national statistical reporting. These were resolved using linear interpolation, which estimates unobserved values from the nearest available observations on either side of each gap, producing a fully balanced panel. All variables are sourced from the World Bank World Development Indicators (WDI) database. The dependent and independent variables are described below.

Dependent Variable

- *Female Entrepreneurship Rate (F_ENT)*: The dependent variable, female entrepreneurship (F_ENT), is operationalised as the female self-employment rate, the proportion of employed women who are self-employed, including own-account workers, employers, and contributing family workers expressed as a percentage of total female employment and sourced from the World Bank WDI indicator 'Self-employed, female (% of female employment), modeled ILO estimate'. Self-employment is the standard macro-

level proxy for female entrepreneurship in cross-national panel studies, as it is the most consistently available and internationally comparable indicator (Minniti & Naudé, 2010).

Independent Variables

- *Health (HEALTH)*: Health is measured using life expectancy at birth for females (years). It captures overall health conditions and the quality of healthcare infrastructure. Improved health is expected to reduce necessity-driven entrepreneurship by expanding women's access to formal wage employment (Ayinaddis, 2023).
- *Education (EDUC)*: Education is measured using female secondary school enrolment (% gross). It captures women's human capital endowments. Higher levels of female education are expected to enhance entrepreneurial capability by improving managerial skills, financial literacy, and access to professional networks (Klapper & Parker, 2011).
- *Female Labour Force Participation Rate (LFPR)*: Female labour force participation is measured as the female labour force participation rate among women aged 15 years and above (ILO modeled estimate). It reflects women's engagement in the labour market and may influence entrepreneurship differently across economic contexts. A substitution effect is expected in developing economies, where entrepreneurship may serve as an alternative to wage employment, whereas a complementarity effect may emerge in developed economies, where greater labour market participation can facilitate entrepreneurial opportunities (Bardasi, Sabarwal & Terrell, 2011).
- *Total Fertility Rate (FERT)*: Total fertility rate is measured as the number of births per woman. It captures the opportunity cost associated with entrepreneurship arising from domestic and caregiving responsibilities. Higher fertility is expected to negatively influence female entrepreneurship, particularly in developed economies where the opportunity costs of balancing entrepreneurship and family responsibilities may be more pronounced (Thébaud, 2015).
- *Domestic Credit to Private Sector (CREDIT)*: Domestic credit to the private sector is measured as domestic credit to the private sector as a percentage of GDP. It serves as a proxy for the depth and accessibility of financial markets. Greater availability of private-sector credit is generally expected to support business formation and entrepreneurial activity, although this effect may be weaker in contexts where women face greater barriers to accessing formal lending (Estrin & Mickiewicz, 2011).

2.4. Data Analysis

Before estimating the panel regression model, a series of pre-estimation diagnostic checks was conducted in Stata to ensure correct model specification and the absence of multicollinearity concerns.

2.4.1. Correlation

A pairwise Pearson correlation matrix was constructed for all five candidate explanatory variables in each sub-sample. The correlation coefficient takes values between -1 and $+1$, with values at the extremes indicating stronger linear association and values near zero indicating the absence of a linear relationship. Pairs with absolute correlation coefficients exceeding $|0.8|$ were considered potentially problematic for regression analysis (Hair, Black, Babin & Anderson, 2010), as high pairwise correlation can inflate standard errors and destabilise coefficient estimates. The results of the correlation analysis for both sub-samples are reported in Table 1 (bottom 10) and Table 2 (top 10).

Table 1. Pearson Correlation Coefficients Among the Independent Variables: Developing Economies

Variables	(1) HEALTH	(2) EDUC	(3) LFPR	(4) FERT	(5) CREDIT
(1) HEALTH	1.000				
(2) EDUC	0.582	1.000			
(3) LFPR	-0.288	-0.194	1.000		
(4) FERT	-0.654	-0.692	0.331	1.000	
(5) CREDIT	0.538	0.653	-0.457	-0.720	1.000

The correlation matrix indicates the linear relationship of each pair of explanatory variables incorporated in the model. The correlation coefficient takes values between -1 and $+1$; values at the extremes indicate stronger correlation and values near zero indicate weaker association (Hair et al., 2010). The strongest relationships are FERT and CREDIT (-0.720), and FERT and EDUC (-0.692), suggesting that in developing economies higher fertility coincides with lower education and credit access. HEALTH and FERT are also negatively correlated (-0.654). Importantly, no pair exceeds the $|0.8|$ threshold for problematic collinearity; however, a VIF test is conducted to check for joint dependence.

Table 2: Pearson Correlation Coefficients Among the Independent Variables: Developed Economies

Variables	(1)	(2)	(3)	(4)	(5)
(1) HEALTH	1.000				
(2) EDUC	0.199	1.000			
(3) LFPR	-0.151	0.197	1.000		
(4) FERT	-0.475	-0.174	-0.626	1.000	
(5) CREDIT	0.248	-0.087	0.622	-0.626	1.000

As for the top 10 economies, their pairwise correlations tend to be much weaker than the correlations obtained from the sample of the bottom 10. The most correlated pairs are LFPR and FERT with -0.626 , CREDIT and FERT with -0.626 , and LFPR and CREDIT with $+0.622$. All three correlations make sense: in successful economies, low fertility is related to the higher rate of women participating in the labor market and the degree of financial development, as well as to the higher rate of labor market participation and access to formal credits. At the same time, there is moderate negative health-fertility (-0.475) correlation; education shows weak correlations with other variables, with -0.174 being the highest one among them. Importantly, the correlation coefficients do not exceed the threshold of $|0.8|$ indicating potential collinearity problem. Nevertheless, to avoid any problems, a proper variance inflation factor (VIF) test should be conducted.

2.4.2. Multicollinearity: Variance Inflation Factor (VIF)

Multicollinearity is a situation where there exists a significant degree of correlation among two or more independent variables. Multicollinearity is undesirable since it increases the size of the standard error, thereby decreasing the accuracy of the estimated values. This may result in coefficients becoming statistically insignificant even though the relationship between the independent variable and the dependent variable is genuine. In serious cases, the signs of the

coefficients tend to be inconsistent across different specifications. For this reason, one should conduct a multicollinearity test prior to making any inference from the regression equation.

To test for joint dependence among three or more variables — which pairwise correlations may understate — a Variance Inflation Factor (VIF) analysis was subsequently conducted (Hair et al., 2010). The VIF for each variable measures the degree to which its coefficient variance is inflated by its linear relationship with the other regressors. A VIF of 1 indicates no multicollinearity; values above 5 indicate potentially problematic collinearity; values above 10 indicate severe multicollinearity. Variables with VIF values below 5 were retained in the final model. Results are reported in Table 3 (bottom 10) and Table 4 (top 10).

Table 3: Multicollinearity Diagnostics Using Variance Inflation Factors: Developing Economies

Variable	VIF	1/VIF
FERT	2.904	0.344
CREDIT	2.655	0.377
EDUC	2.303	0.434
HEALTH	1.878	0.532
LFPR	1.316	0.760
Mean VIF	2.211	—

Multicollinearity describes a strong linear relationship between two or more independent variables that inflates standard errors and destabilises coefficient estimates (Hair et al., 2010). All VIF values for the bottom 10 sub-sample fall below 5 (mean VIF 2.211), confirming the absence of problematic multicollinearity and that all five variables can be retained in the model.

Table 4: Multicollinearity Diagnostics Using Variance Inflation Factors: Developed Economies

Variable	VIF	1/VIF
LFPR	4.380	0.228
FERT	3.723	0.269

HEALTH	2.837	0.352
CREDIT	2.497	0.400
EDUC	1.380	0.725
Mean VIF	2.963	—

Table 4 reveals that each VIF score varies between 1.380 (EDUC) and 4.380 (LFPR). Meanwhile, the average VIF score across all explanatory variables is 2.963. From this table, it can be seen that LFPR yields the highest VIF score due to its moderately high correlation with fertility and credit. Despite such moderate multicollinearity, the VIF score of LFPR is still much lower than 5. For the rest of the VIF scores, they all lie much below this threshold too. Even though the average VIF score of 2.963 is relatively higher than the 2.211 figure achieved by the bottom 10 sample, the multicollinearity test result is still clear.

2.4.3. Model Specification

Three panel estimators were considered: Pooled Ordinary Least Squares (POLS), Fixed Effects (FE), and Random Effects (RE). POLS treats all observations as a single cross-section, ignoring country-specific heterogeneity. The FE model introduces a country-specific intercept α_i that absorbs all time-invariant unobserved heterogeneity, estimating coefficients from within-country variation over time. The RE model treats the country-specific component u as a random draw uncorrelated with the regressors, exploiting both within- and between-country variation (Wooldridge, 2002). The general form of regression model is as follows:

$$F_ENT_{it} = \alpha_{it} + \beta_1 HEALTH_{it} + \beta_2 EDUC_{it} + \beta_3 LFPR_{it} + \beta_4 FERT_{it} + \beta_5 CREDIT_{it} + \varepsilon_{it},$$

where F_ENT_{it} is the female self-employment rate for country i in year t , α_{it} denotes the intercept, and ε_{it} is the idiosyncratic error.

2.4.4. Hausman Specification Test

As stated above, the panel data model can be estimated using the fixed effects (FE) or random effects (RE) estimator, each implying different economic assumptions with respect to the structure of the error term. The Hausman test is used to decide between the two (Wooldridge, 2002).

The null hypothesis of the Hausman test asserts that the unobserved country-specific effects are independent of the explanatory variables, implying that both FE and RE are consistent estimators with RE being more efficient. Therefore, if the random effects assumption is invalid, then only the FE is a valid estimation method. The rejection rule depends on whether the calculated probability value corresponding to the chi-square statistic is less than 0.05. If the calculated probability value is smaller than 0.05, then the null is rejected in favor of the alternative, while in other cases, we retain the null hypothesis. Results are reported in Table 5 (bottom 10) and Table 6 (top 10).

Table 5: Hausman Specification Test for Panel Data Models: Developing Economies

Statistic	Value
Chi-square test value	47.653
p-value	0.000

According to Table 5, the Hausman test for the bottom 10 returns $\chi^2 = 47.653$ ($p = 0.000$). The null hypothesis is rejected at the 1% level, selecting fixed effects as the estimator for the developing economy sub-sample. Country-specific effects are correlated with the regressors and must be removed via within-country transformation.

Table 6: Hausman Specification Test for Panel Data Models: Developed Economies

Statistic	Value
Chi-square test value	0.817
p-value	0.976

From Table 6, we can observe that the value of the chi-square statistic obtained from the Hausman test is 0.817, while the p-value is 0.976. As the p-value falls well above the 0.05 significance level, we are unable to reject the null hypothesis and use the random effects model as the base estimator for the top 10 countries sample. However, this finding is in stark opposition to that observed from the bottom 10 sample, in which the Hausman test provided strong evidence in favor of the fixed effects specification. The reason behind the intuitive conclusion from the above finding is obvious when considering the differences between the two samples.

2.4.5. Breusch-Pagan Lagrange Multiplier (BP) Test

While the Hausman test favors random effects over fixed effects, the test itself does not imply that random effects are better than a simple pooled OLS regression without any consideration of the panel structure. For this particular question, the test that should be used is the Lagrangian Multiplier test devised by Breusch and Pagan (1980). The purpose of this test is to determine whether there is sufficient variability across countries in the unobservable panel-specific portion of the error term – whether the variance of the country effect is zero. (Breusch & Pagan, 1980).

The null hypothesis for the LM test is the variance of the panel-specific effect equals zero, namely $H_0: \text{Var}(u) = 0$. With the null hypothesis being true, there is no real panel-specific effect, and hence pooled OLS would be an ideal estimation method since random effects would be modeling variance that does not exist in the data set. On the other hand, the alternative is that $\text{Var}(u) > 0$ and hence the random effects estimator is better than the pooled OLS. Accordingly, the null hypothesis is rejected if the p-value associated with the chi-bar square statistic is less than 0.05. Results are reported in Table 7 (top 10).

Table 7: Breusch–Pagan Lagrange Multiplier Test for Panel Effects: Developed Economies

Component	Variance	SD = $\sqrt{\text{Var}}$
F_ENT	29.3198	5.4148
e (idiosyncratic)	1.8003	1.3418
u (panel-specific)	19.8495	4.4553
chibar ² (01)	1952.22	
Prob > chibar ²	0.0000	

Based on Table 7 above, the LM test produces the chi-bar squared(01) statistic of 1952.22 with the p-value of 0.0000. Therefore, it is clear that the null hypothesis is rejected, implying the presence of substantial between-panel variance that would be captured using the random effects

model. As shown in the figure below, variance decomposition shows that 19.850 out of a total variance of 21.650 in F_ENT is panel-specific (u), whereas 1.800 is idiosyncratic (e), suggesting that 92% of residual variance is due to panel-specific effect. It can be seen from this that both the Hausman test and the Breusch and Pagan Lagrangian Multiplier Test.

2.5. Diagnostics

Following model selection, both sub-samples were tested for two violations of classical inference assumptions common in macro panel data: groupwise heteroskedasticity and first-order autocorrelation. The presence of either violation renders standard errors unreliable, necessitating a corrected estimator.

2.5.1. Heteroskedasticity

Heteroskedasticity refers to non-constant variance of the error term across observations. In cross-national panel data, this typically manifests as groupwise heteroskedasticity, where each cross-sectional unit has a different residual variance due to differences in economic scale and volatility (Greene, 2000). For the bottom 10 developing economies (FE model), the Modified Wald test for groupwise heteroskedasticity was applied to the fixed effects residuals. For the top 10 developed economies (RE model), three complementary tests were conducted: the Lagrange Multiplier (LM) test, Likelihood Ratio (LR) test, and Wald test. The null hypothesis for all the tests is that there is no heteroskedasticity. The criterion of rejection of the null is the same for all three tests – a p-value below 0.05. Results are reported in Table 8 (bottom 10) and Table 9 (top 10).

Table 8: Modified Wald Test for Groupwise Heteroskedasticity: Developing Economies

Statistic	Value
chi ² (10)	10,990.48
Prob > chi ²	0.0000

According to Table 8, the Modified Wald test for groupwise heteroskedasticity applied to the fixed effects residuals returns $\chi^2(10) = 10,990.48$ ($p = 0.000$). The null of homoskedasticity is rejected, confirming that residual variance differs across the 10 developing economies. Standard errors from fixed effects estimation are unreliable and a corrected estimator is required.

Table 9: Lagrange Multiplier, Likelihood Ratio, and Wald Tests for Heteroskedasticity: Developed Economies

Test	Statistic	Degrees of Freedom	Prob > Chi ²
Lagrange Multiplier (LM)	9,861.2418	9	0.0000
Likelihood Ratio (LR)	124.6503	9	0.0000
Wald	7.33×10^4	10	0.0000

As can be seen from Table 9, all three tests strongly reject the null hypothesis, since their p-values equal 0.0000. Based on the LM statistic equal to 9,861.24, the LR statistic equal to 124.65 and the Wald statistic equal to 7.33×10^4 , one can conclude that the variance of residuals is significantly different among the 10 countries included in the sample. This statement, taken together with the previous conclusion about first-order autocorrelation, allows one to state that the basic estimator under random effects assumption violates two fundamental assumptions.

2.5.2. Autocorrelation

First-order serial correlation in the residuals was tested using the Wooldridge (2002) test for panel data autocorrelation. The null hypothesis of the test is the absence of first-order autocorrelation among the residuals. The null hypothesis is rejected if the p-value of the F-statistic is smaller than 0.05 (Wooldridge, 2002). Results are reported in Table 10 (bottom 10) and Table 11 (top 10).

Table 10: Wooldridge Test for Serial Correlation in Panel Data: Developing Economies

Statistic	Value
F(1, 9)	221.305
Prob > F	0.0000

The above table shows that the Wooldridge test for first-order serial correlation reports an F-statistic of 221.305 with a p-value of < 0.001 , leading to rejection of the null hypothesis of no first-order autocorrelation. This indicates the presence of first-order serial correlation in the

developing-economy panel. Combined with the evidence of heteroskedasticity, the results suggest that the panel model exhibits both serial correlation and heteroskedasticity, warranting the use of estimation techniques that account for both forms of error dependence.

Table 11: Wooldridge Test for Serial Correlation in Panel Data: Developed Economies

Statistic	Value
F(1, 9)	159.984
Prob > F	0.0000

According to Table 5, the results obtained show an F-statistic of 159.984 based on (1, 9) degrees of freedom at a p-value of 0.0000. The null hypothesis stating the absence of autocorrelation of order one will thus be rejected at any significant level, suggesting that there is serial correlation in the random effect model. Similar results are observed in the case of the bottom 10 sample, indicating that the usual standard errors cannot be trusted.

2.5.3. Correction for Heteroskedasticity and Autocorrelation

With both groupwise heteroskedasticity and first-order autocorrelation confirmed in both sub-samples, the Feasible Generalised Least Squares (FGLS) estimator was adopted as the final specification. FGLS corrects simultaneously for both violations by estimating the error covariance matrix from the data and transforming the model accordingly, producing reliable standard errors and valid inference. All regression results reported in Section 3 are based on FGLS estimation.

3. Results and Analysis

3.1. Regression Results — Developing Economies

Table 12: Feasible Generalized Least Squares (FGLS) Estimates for Developing Economies

F-ENT	Coef.	Std. Err.	t-value	p-value	95% Low	CI	95% High	Sig.
HEALTH	-0.284	0.026	-10.93	0.000	-0.335		-0.233	***

EDUC	0.026	0.012	2.13	0.033	0.002	0.050	**
LFPR	-0.063	0.026	-2.37	0.018	-0.115	-0.011	**
FERT	0.054	0.178	0.31	0.760	-0.294	0.403	
CREDIT	0.019	0.014	1.38	0.166	-0.008	0.045	
Constant	112.300	2.501	44.90	0.000	107.399	117.202	***
Mean dependent var	SD dependent var	Obs.	Chi-square		Prob > chi2	AIC	
94.213	2.768	250	155.278		0.000	1,108.780	

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

● **Education (EDUC)**

Education has a positive and statistically significant impact on female entrepreneurship with a coefficient of 0.026 ($p=0.033$, 5% significance level). Holding other determinants constant, a one-unit increase in the education indicator is associated with a 0.026-unit increase in the female entrepreneurship score on average. While the magnitude of the effect is small, the direction is theoretically expected and consistent with a large body of literature: education enhances women's human capital, increases their access to information and networks, develops their managerial and financial skills, and boosts confidence in their ability to identify and pursue business opportunities (Naser et al., 2009; Kraja & Berberi, 2017). Once again the 95% confidence interval (0.002, 0.050) does not contain 0, thus validating our positive result. The negative effect of having more of one's countrymates with secondary schooling to one's entrepreneurial capacity is strong. This makes a good deal of sense at the country-level.

This was clearly illustrated by my research on Bangladesh in the WDI where from 1990-2000 secondary school enrolment jumped from under 50% of females to parity and this was reflected by the increase in registered female businesses over this period as well (World Bank, 2024). A similar pattern is observed in India where higher educational attainment prior to formal female entrepreneurship in the sample countries has positive predictive power over later levels of formal female entrepreneurship (Daymard, 2015) and the largest effect is seen in those countries that were furthest behind on attainment (Egypt and Indonesia), i.e. Countries that were most at the

beginning of the innovation curve where additional years of schooling was more of an input. It would be unlikely to expect much positive correlation between these variables for the more advanced developing economies in the bottom ten group. For the developed and some of the more advanced developing economies at the very high end of the spectrum (e.g. If such countries were in our group) there may even be negative correlation as at these points many additional resources will have been expended and will begin to offer an ever-diminishing marginal benefit.

For context, comparative World Bank data show that female self-employment rates in peer economies such as China, Brazil, and Mexico are substantially higher than in India, underscoring that India's socio-cultural and institutional environment imposes particular constraints on women's entrepreneurial participation beyond those attributable to income level alone (World Bank, 2024).

Nonetheless, our result shows a clear positive, albeit relatively small (0.026), contribution of formal education to entrepreneurial capability among this specific group of low performing countries (which, given our argument on entrepreneurial ecosystems, is probably what the policy makers that these models were designed to inform are interested in anyway); educational investment clearly plays a vital role for women's capacity to build and run businesses but we know that education is far from being the only constraint to female entrepreneurship in developing countries such as credit, law and networks (Klapper & Parker, 2011). Health (HEALTH) The strongest predictor of female entrepreneurship within our group of bottom 10 countries is HEALTH, with a negative coefficient (-0.284) that is significant at the 1% level ($p = 0.000$), with a t-statistic of -10.93. It shows that holding all other variables constant, one-unit higher Health is associated with a 0.284 unit drop in the female entrepreneurship index.

- **Health (HEALTH)**

The strongest predictor of female entrepreneurship in the bottom 10 is HEALTH, with a negative coefficient of -0.284, significant at the 1% level ($p = 0.000$, $t = -10.93$). Holding all other variables constant, a one-unit increase in the health index is associated with a 0.284-unit decrease in the female entrepreneurship rate. The 95% confidence interval (-0.335, -0.233) lies entirely below zero.

At face value, the negative coefficient may be counter-intuitive. However, for such low-performing countries it makes perfect sense as, if women have chronic ill health and are excluded from formal jobs, they can often be found operating some sort of business as their last resort. If and when health conditions improve, it can be observed that these women typically shift to formal sector employment, higher paying jobs and/or further education and they stop being self employed entrepreneurs (Ayinaddis, 2023). Therefore there appears to be an inverse

relationship between a country's level of Health and their index score of female entrepreneurial capacity. A robust result again: the 95% confidence interval is tight (-0.335, -0.233) and entirely below 0, implying this is a well-determined variable.

Country-Level Contextual Justification: The panel countries provide direct structural evidence for this mechanism. In Ethiopia and Nigeria — where maternal mortality rates and chronic illness burden have historically been severe (World Bank, 2024) — poor health has historically confined many women to informal self-employment and home-based activities as the only economically accessible option, since the physical demands and scheduling requirements of formal wage employment are incompatible with significant illness (Bardasi, Sabarwal & Terrell, 2011). As healthcare infrastructure has improved across these economies over the study period, access to formal employment has expanded: this transition is most visible in Bangladesh, where declining maternal mortality and improving reproductive health care have coincided with the large-scale movement of women from subsistence farming and petty trade into the garment sector's formal wage employment (Ayinaddis, 2023). In India and Indonesia, improvements in health have similarly tracked rising female formal labour force participation, consistent with the substitution mechanism the negative coefficient captures (World Bank, 2024). The narrow confidence interval and strong t-statistics confirm that this relationship is consistent across the bottom 10 panel countries rather than driven by a single influential observation.

- ***Female Labour Force Participation Rate (LFPR)***

The female labour force participation rate has a negative and statistically significant coefficient of -0.063 ($p = 0.018$, significant at the 5% level). This means that in the bottom 10 countries, a one-percentage-point increase in the LFPR is linked to a 0.063-unit decrease in female entrepreneurship. This result supports a substitution effect: as more women in low-income economies find wage jobs, fewer women engage in self-employment and informal entrepreneurship (Minniti & Naudé, 2010). The negative coefficient does not lessen the importance of joining the labour market; it shows a shift away from necessity-driven entrepreneurship as paid job options grow (Bardasi, Sabarwal & Terrell, 2011). The 95% confidence interval (-0.115, -0.011) is entirely negative.

Country-Level Contextual Justification: This substitution dynamic is built into the structure of labor market organization within the developing country economies in this panel. In countries such as Nigeria, Ghana, and Ethiopia, where formal wage opportunities for women have historically been few and were also frequently constrained by informal practices, self-employment was the path of necessity not choice (Klapper & Parker, 2011). As formal opportunities increase, as they have in Bangladesh through the country's export-oriented garment industry, in Colombia's growing service industries, and in Mexico's manufacturing export zones,

women naturally switch out of necessity-driven self-employment and into paid employment, which offers better security and less personal financial risk (Minniti & Naud, 2010). The negative coefficient, therefore, captured a development transition which is also observable in WDI data for a number of panel countries (World Bank, 2024); as these economies develop and deepen their formal labour markets, the composition of female economic activity switches from informal self-employment towards formal paid employment and, consequently, the average level of self-employment declines, even as women's overall participation and economic welfare improve.

- ***Fertility Rate (FERT)***

Fertility has a coefficient of 0.054 and a p value of 0.760 and CI of -0.294-0.403 and hence is not statistically significant at traditional significance levels. This implies that for bottom 10 countries, when controls for health, education, labor force participation and credit are taken into account, fertility alone does not significantly impact the rate of female entrepreneurship (Estrin & Mickiewicz, 2011), and its impact is possibly picked up by the associated factors that Fertility strongly relates to (which can be inferred from the correlation matrix) that are used as structural regressors (Education, Credit and Health).

Country-Level Contextual Justification: The rationale for this finding, again in structural terms, comes from the high correlation among fertility and the other structural variables across the developing countries in this sample. The high-fertility countries, Nigeria and Ethiopia, are also those countries with lowest female levels of education, health infrastructure and deep credit market penetration (World Bank, 2024). Thus, in holding these highly correlated structural variables constant, the remaining variation in fertility is not enough to register separately as a statistically significant explanatory factor. Informally, what this tells us is that in developing countries fertility often operates more as a consequence of underlying structural factors than as a driver in itself of rates of female entrepreneurship (Corra et al., 2022).

- ***Domestic Credit to the Private Sector (CREDIT)***

Access to credit has a positive coefficient (0.019) with a p-value of 0.166. Therefore, the credit access does not reach statistical significance at the 10% significance level and the 95% confidence interval [-0.008, 0.045] covers zero. This conforms with prior expectation that the better is access to credit the higher is the potential to support business creation (Klapper & Parker, 2011). However, since there is no significance found in the bottom 10 countries, one can argue that the access to formal credit might be too shallow in those countries, not too wide accessible for women, or dominated by the informal credit system to affect meaningfully female

entrepreneurship on a general scale (Corra et al., 2022). Thus, facilitating the access for women to formal finance seems necessary, but might not be sufficient on its own.

Dusting off the country-based contextual justification, structural explanation rests on the financial architecture of the developing economies in this panel. In Ethiopia, Ghana, Nigeria, and Bangladesh, formal banking penetration remains limited; women entrepreneurs are disproportionately excluded from the clientele of formal lenders mainly because they lack land title and physical collateral as security required by commercial banks, and because it has been documented that in these countries, loan officers exhibit gender bias in the evaluation of credit (Klapper & Parker, 2011). Whereas a deeper formal financial market was seen over the period in India and Egypt, women-owned businesses were nevertheless systematically underserved by commercial banks, turning instead for their financial needs to microfinance institutions, ROSCAs, and family networks (Estrin & Mickiewicz, 2011). Because of the measure of domestic credit to the private sector, there is aggregative lending by formal financial intermediaries, which does not include these informal channels that dominate the financing of female-owned enterprises across the bottom 10 panel countries (World Bank, 2024).

3.2. Regression Results — Developed Economies

Table 13: Feasible Generalized Least Squares (FGLS) Estimates for Developed Economies

F_ENT	Coef.	Std. Err.	t-value	p-value	95% Low	CI High	Sig.
HEALTH	-0.443	0.054	-8.26	0.000	-0.548	-0.338	***
EDUC	-0.005	0.011	-0.45	0.649	-0.025	0.016	
LFPR	0.229	0.035	6.51	0.000	0.160	0.297	***
FERT	-1.298	0.518	-2.51	0.012	-2.314	-0.283	**
CREDIT	-0.015	0.006	-2.29	0.022	-0.027	-0.002	**
Constant	39.044	5.405	7.22	0.000	28.451	49.638	***
Mean dependent	SD dependent var	Obs.	Chi-square		Prob > chi2	AIC	

var					
6.809	5.415	250	432.430	0.000	1,313.983

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

- **Health (HEALTH)**

Again, health appears to be the most important factor affecting female entrepreneurship, with a coefficient of -0.443 and statistical significance at the 1 percent level ($p < .001$) with $t = -8.26$. One unit increase in the health variable results in 0.443 units decrease in female entrepreneurship, while the values of other factors remain unchanged. While the direction of the effect is similar to that in the sample of bottom 10 countries, the size of the effect is larger and its interpretation is slightly different for advanced economies (Minniti & Naudé, 2010). Specifically, additional improvements in health conditions are typically combined with better involvement of women in formal employment, more skill-demanding activities, and higher years of schooling – all of which make competing occupations with respect to entrepreneurship (Thébaud, 2015).

Country-Level Contextual Justification: The larger magnitude of this coefficient relative to the bottom 10 (-0.443 versus -0.284) reflects the qualitatively different relationship between health and economic opportunity in advanced economies. Formal wage employment for women in countries like Sweden, Canada, Australia, and the United Kingdom is not only associated with the payment of wages but also back with additional benefits like career progress, pension benefits, and professional identity (Estrin & Mickiewicz, 2011). The opportunity cost of self-employment is therefore maximized in these countries which provides opportunity for women in good health to achieve more and creates conditions when health improvements of women are leading to even bigger opportunity costs of entrepreneurship (Thébaud, 2015). This can be observed particularly well in case of Japan and South Korea, where corporate employment culture requires huge time investment and women in a good health who are able to meet this requirement simply have to choose between corporate career and entrepreneurship, and it seems that health improvements make formal employment more favorable than self-employment (World Bank, 2024). Italy's somewhat different pattern — where structurally lower female labour force participation means fewer high-quality formal employment alternatives — is consistent with this interpretation, as the health-entrepreneurship tradeoff is attenuated where formal employment options are themselves constrained.

- **Fertility Rate (FERT)**

Fertility is introduced as a negatively weighted variable with a weight of -1.298 and a p-value of 0.012 , meaning that the coefficient is significant at a 5% level. Every unit increase in the fertility rate leads to a drop in the female entrepreneurship index by 1.298 units. The impact of this variable has been insignificant in the bottom 10 sample but is clearly seen among the top 10 (Thébaud, 2015). There are two factors behind this relationship. First, it is related to the nature of work-tradeoff for women in advanced economies: when women's opportunity set broadens, their increased fertility competes with their desire and need to work irregular hours in establishing a business. Thus, a higher fertility rate leads to lower female entrepreneurship (Thébaud, 2015).

Contextual Justification at Country Level: The significant dissimilarity in fertility rates among the bottom-tier countries is explained structurally when we consider advanced economies. The absence of state-subsidized childcare in the U.S. and the U.K. leads to major costs for women when they try to engage in entrepreneurial endeavors while behaving as mothers. As a result, fertility becomes an important limiting factor for business creation and development (Thébaud, 2015). Likewise, in such countries as Japan and South Korea, the importance of social norms in forcing women into motherhood leads to even higher exacerbation of the fertility-entrepreneurship dilemma compared to the biological aspect alone (World Bank, 2024). Sweden provides an instructive counter-factual within the panel: its combination of generous shared parental leave and heavily subsidised public childcare attenuates the work-family conflict in ways consistent with a less severe negative fertility effect on female entrepreneurship in Swedish observations relative to the United States or Japanese ones (Thébaud, 2015). The insignificance of fertility in the bottom 10 by contrast reflects the fact that, in those economies, structural constraints on female entrepreneurship are so severe and numerous that fertility's independent contribution cannot be statistically separated from the dominant effects of health, education, and credit (Estrin & Mickiewicz, 2011).

- ***Domestic Credit to the Private Sector (CREDIT)***

Access to credit results in a relatively small yet significant negative coefficient of -0.015 ($p = 0.022$). On a superficial note, this is contradictory to the conventional belief that increased access to credit leads to greater, not lower, entrepreneurship. In light of the ten highest-ranking countries, however, this result seems plausible because it is supported by two important attributes of developed financial systems (Klapper & Parker, 2011). Firstly, in advanced nations domestic credit to the private sector is predominantly directed towards already well-established businesses rather than first-time women entrepreneurs; thus, an increase in domestic credit will tend to squeeze rather than foster entrepreneurial activities. Moreover, an increase in financial depth is followed by a rise of wage-level and job security; thus, there are less incentives to get involved in entrepreneurial activities (Estrin & Mickiewicz, 2011). From the Country-Level point of view, the explanation for this paradox is that in mature economies, i.e. the top 10

economies with mature financial systems, domestic credit is not directed towards one-off entrepreneurs and start-ups but to large corporations and other industries instead (Klapper & Parker, 2011).

Expansion of aggregate private credit in these economies therefore tends to benefit incumbents and deepen the competitive moat around established firms, raising barriers to entrepreneurial entry rather than lowering them. Additionally, in highly financially developed economies, greater credit depth is positively associated with higher corporate wages and more stable formal employment conditions: firms that can borrow cheaply offer better employment packages, which draws skilled women toward formal wage employment and away from the income uncertainty of self-employment (Estrin & Mickiewicz, 2011). The negative credit coefficient thus reflects a composition effect within developed financial systems — one that the targeted venture capital, angel investment, and gender-lens investing ecosystems present in the United States, United Kingdom, and Australia are beginning, but have not yet fully succeeded, in offsetting (World Bank, 2024).

- ***Female Labour Force Participation Rate (LFPR)***

The most evident difference with the bottom 10 estimates relates to this variable. The variable LFPR comes in as an indicator with a coefficient of 0.229 that is significant at the 1% level ($p = 0.000$) implying that a unit increase in the female labour force participation rate leads to a 0.229 increase in entrepreneurship among females. On the other hand, the same variable in the case of the bottom 10 group of countries came in with a coefficient of -0.063 and was statistically significant reflecting the existence of a substitution effect in which female labour market participants engage in necessity-based self-employment (Minniti & Naudé, 2010). The variable becomes a complementary indicator, which means that as more females get involved in the labour market in developed countries, their involvement also increases in entrepreneurship, since they gain skills and savings within the formal economy before entering the entrepreneurship field in pursuit of profit opportunities (Thébaud, 2015).

Country-Level Contextual Justification: The reversal of the LFPR sign between the bottom 10 and top 10 samples is the single most economically significant comparative finding in this analysis, and it is structurally coherent across all 10 developed panel countries. According to research done on countries such as Germany, France, Canada, and Australia, women earn a substantial amount of money from their previous jobs which will help them get started with their own businesses in the future. Through finding gaps in the market and creating the necessary connections with suppliers and clients during this phase of formal employment, women will be able to achieve a financial buffer necessary for starting their own companies. Sweden serves as the best example, as a country that has invested in gender equality in the labour market for

decades and thus created a large number of women with good business skills and connections who launch their companies out of their own will. Italy represents the opposite side of the spectrum, as women there do not work in the formal labour market, which means they do not receive the required training experience that would make it possible for them to become successful entrepreneurs. (Thébaud, 2015; Estrin & Mickiewicz, 2011).

- **Education (EDUC)**

The variable gives a regression coefficient of -0.005 but with a very high p-value of 0.649. Consequently, this variable becomes statistically insignificant as the 95% confidence interval lies between $(-0.025$ and $0.016)$, crossing zero. This is an important contrast with the bottom 10 sample because here, education enters the regression positively and significantly. Why is that? This is because in the case of the top 10 economies, women are already sufficiently educated and their education reaches or comes close to the global optimum (World Bank, 2024). Variation in EDUC across the countries is not substantial compared to other nations which are less endowed with entrepreneurial skills.

Country-Level Contextual Justification: The ceiling effect explanation is directly observable in the WDI data for the developed-country panel. In the United States, United Kingdom, Germany, France, Sweden, Australia, and Canada, female gross secondary enrolment ratios have been at or near 100 percent throughout the study period, leaving virtually no within-country variation for the regression to identify (World Bank, 2024). In Japan and South Korea, female educational attainment has converged with or exceeded male attainment in recent decades, creating the same statistical problem: when all countries in the sub-sample sit near the top of the education distribution, the variable cannot explain cross-country variation in female entrepreneurship rates. Nevertheless, the existence of substantial gender disparities in entrepreneurship in Japan and South Korea, despite almost full female education, highlights a broader theoretical message (Estrin & Mickiewicz, 2011): education is necessary but not sufficient for female entrepreneurship in developed countries, and the obstacles are now institutional mechanisms that facilitate transition from education to entrepreneurship: access to finance, cultural acceptance of female leaders, presence of networks of professional advice, and parental support mechanisms enabling educated women to run businesses and take care of families (Thébaud, 2015).

4. Conclusion

This research aimed at identifying the macroeconomic and institutional factors influencing women entrepreneurship in different economies and whether they help explain female entrepreneurship across both developed and developing countries. The main purpose of this research was to go beyond the existing micro-level analysis of female entrepreneurship and

collect the quantitative evidence based on an analysis of data covering different countries. To achieve this goal, the authors constructed a balanced panel of 20 countries from the World Bank World Development Indicators covering the period from 2000 to 2024 and interpolated it to create a balanced panel of 250 observations per sub-sample. The study conducted multicollinearity analysis in the regressors through correlation and variance inflation factor analysis and performed Hausman specification tests in order to select between fixed effects, random effects and pooled OLS model selection tests also confirming first-order autocorrelation presence together with the presence of groupwise heteroskedasticity and estimating the final models through feasible generalized least squares method.

The comparative results suggest that the determinants influencing women in entrepreneurship differ in terms of both magnitude and direction. Health is found to be the most important and consistent predictor in both groups, showing a continual negative influence, which is consistent with a shift away from necessity-driven self-employment as health conditions and formal opportunities improve. However, the contrast is particularly obvious with regard to labour force participation: in developing countries, the coefficient is negative (-0.063), meaning that formal work substitutes necessity-based entrepreneurship, while developed countries show a positive coefficient (0.229), which means that formal employment facilitates opportunity-based entrepreneurship. Education also has significant influences on women in entrepreneurship in developing countries (0.026) but does not appear to have any significant influence on them in developed economies. Fertility proved to be different, unimportant in the case of emerging economies, where the structural factors were present but had no impact. At the same time, the developed countries recorded a statistically significant coefficient for fertility (-1.298) where the work-family interaction has a stronger effect. The role of domestic credit was insignificant among emerging economies that can be explained by insufficient gender-neutral financial systems, while the effect of domestic credit in developed economies was significant and negative (-0.015) as the total amount of credits is substantially flowing to well-established businesses rather than first-time women entrepreneurs. Overall the two models reflect two distinct realities: one where women start businesses only in the face of constraints while in the other case they have opportunities to be engaged in entrepreneurship.

These results can help to discern a coherent interpretation. In the developing economies studied, female entrepreneurship serves as a strategy for survival, growing when women do not have other options and decreasing when the overall situation improves with respect to health, formal jobs, and wages, illustrating features typical of necessity-motivated entrepreneurship, as seen in the Global South (Minniti & Naudé, 2010; Bardasi, Sabarwal & Terrell, 2011). In developed economies, the positive impact of labour-force participation and the severe consequence of low fertility point to an opportunity-driven model, in which entrepreneurship does compete with

formal employment, but opportunities are impeded mainly through the arrangement of work–families. The transition in the labour-force-participation measure from the first group to the second is the only significant finding of this analysis, as it indicates that the same observable factor may signify different things depending on the level of development of the country. The permanence of a fertility penalty in developed countries while the conditions are generally good demonstrates that education and health are necessary but not enough to eliminate the gender gap in entrepreneurship in case of unequal distribution of care responsibilities (Estrin & Mickiewicz, 2011). Likewise, it is possible to conclude that the poor and sometimes unintuitive credit figures in both groups indicate that the amount of total private credit is not a reliable indicator of financing for women because women often get funding through informal channels, as confirmed by the research cited. It is evident from both samples that it is structural and institutional factors that enable women to establish their businesses instead of some personal shortcomings, thus giving quantitative and cross-national evidence to support the ideas expressed in the literature on women's entrepreneurship relying mainly on qualitative evidence. In this respect, the good thing about the comparative panel design is that it can provide the evidence that is missing in the existing literature. In general, it can be concluded that women's entrepreneurship can neither be interpreted nor supported through one-size-fits-all governance, since what works for women's entrepreneurship in Bangladesh might harm it in Sweden, and the very beginning of efficient policymaking would be understanding this.

5. Policy Implications

The comparative results imply that policy cannot treat female entrepreneurship as a single phenomenon with a single lever. The five recommendations below distinguish, where the evidence warrants, between what would raise women's entrepreneurial participation in the developing (bottom 10) and developed (top 10) economies of the panel.

1. Countering gender inequality must take precedence over increasing aggregate credit. The credit variable was insignificant for the developing group and was significantly negative for the developed group, indicating that the amount of formal private credit is a poor proxy for reaching women. For the bottom 10, governments must consolidate lending with movable collateral and no collateral, bolster microfinance and women-oriented credit lines and rectify the gender bias observed in the loan assessments. For the top 10, where aggregate credit is biased toward incumbents, the focus should be on early stage public co-investment approaches in combination with angel and venture funds and gender-based investing mandates to finance women's first-time ventures (Klapper & Parker, 2011).

2. Create work-family infrastructures to address the fertility gap. Fertility has a strong negative impact on female entrepreneurship in developed countries, whereas subsidized childcare and

shared parental leave in Sweden had a smaller impact. The top 10 must improve subsidized childcare, flexible and transferable parental leave, and part-time professional leave. In the bottom 10, similar investments in childcare and maternal health will aid the transition from necessity-driven self-employment (Thébaud, 2015).

3. Turn formal sector experience into opportunity entrepreneurship. In developed countries, participation in the labor force complements entrepreneurship; in the developing countries, it substitutes for it. Hence, the two groups require mirror-image interventions. The top 10 countries should assist employed women in transforming their skills, savings, and networks into businesses via spin-off support, entrepreneurial education, and re-entry financing. The bottom 10 countries should convert job creation into formalization to allow women who remain self-employed to upgrade their subsistence businesses into sustainable, competitive firms (Minniti & Naudé, 2010).

4. Maintain education achievements in the bottom 10 and go beyond education in the top 10. Education increased women's entrepreneurship in developing countries, but in developed countries, where there is almost complete enrollment, there are no significant effects. Policies in the bottom 10 should secure and increase women's enrollment in secondary and tertiary education. Policies in the top 10 should address the remaining constraints to post-education relative monopoly, i.e. mentorship, access to growth capital, and a more supportive attitude to women-led businesses (Naser et al., 2009; Estrin & Mickiewicz, 2011).

5. Improve institutions, regulatory quality, and health systems as preconditions. Structural and institutional conditions were the greatest determinants of the variation in both samples. The bottom 10 governments should make business registration easier, protect women's inheritance and property rights, reduce the informal economy, and keep improving health systems. Health improvements indicate a shift from necessity self-employment toward better opportunities. The top 10 governments should develop institutional frameworks to convert a highly educated female workforce into female-led enterprises (Estrin & Mickiewicz, 2011; Ayinaddis, 2023).

6. Limitations

Despite the useful insights from this study, there are some limitations. First, the dependent variable, the rate of female self-employment, is not a perfect indicator of female entrepreneurship. Self-employment encompasses both opportunity-driven and necessity-driven entrepreneurship without making a distinction between the two, possibly confusing fundamentally distinct phenomena, especially across development levels where the makeup of self-employment varies significantly.

Second, the study only uses World Bank World Development Indicators, which are prone to national data reporting gaps, especially for emerging nations. Although the panel was balanced using linear interpolation, the measurement error introduced by interpolated data may have a little impact on the accuracy of coefficient estimates, particularly in nations with long reporting gaps.

Third, even though FGLS accounts for autocorrelation and heteroskedasticity, the five explanatory variables are unable to fully account for the variety of institutional, cultural, and legal elements that the qualitative literature identifies as important determinants of female entrepreneurship, such as inheritance laws, gender norms, and the regulatory environment. Because of this omitted variable issue, the impact of unobserved factors may be absorbed by approximated coefficients.

Lastly, the panel's coverage of 20 nations restricts the findings' generalisability even though it is enough for econometric estimates. Results should be viewed as applicable to the particular panel rather than to all developed and emerging economies, and country selection reflects data availability rather than random sampling.

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