

The impact of infrastructure and entrepreneurship support programs on the Female TEA Ratio: A PMG-ARDL approach in an urban context

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Abstract. The purpose of this article is to improve our understanding of the factors that influence the Female/Male Total Early-stage Entrepreneurial Activity (TEA) ratio in urban environments. Its goal is to provide policymakers with a solid scientific foundation as well as to suggest new research directions in the field of female entrepreneurship. The study focuses on how macroenvironmental factors influence the Female/Male TEA Ratio in urban contexts within BRICS countries. Several key factors are considered in the analysis, including entrepreneurial finance, government support policies, entrepreneurship support programs, commercial and legal infrastructure, and physical infrastructure. The research findings confirm the hypothesis that commercial and legal infrastructure, as well as government measures to support entrepreneurship, have a negative long-term influence on the Female/Male TEA Ratio by using the PMG-ARDL method and examining data from the Global Entrepreneurship Monitor (GEM). Furthermore, the findings show that entrepreneurship support programs and physical infrastructure have a positive impact on the ratio. However, no significant impact on entrepreneurial finance has been observed in both the short and long term. The article emphasizes the importance of taking into account the regional dimension when developing entrepreneurship support policies, as well as the unique characteristics of each urban area.

1. Introduction

For emerging economies, promoting debates and initiatives around supporting women's entrepreneurship remains a relevant research topic. Its significance extends not only to national policymakers but also to global organizations working on issues of economic development in emerging economies. Still relatively unexplored, the field of women's entrepreneurship in these economies remains a thriving area of research. Therefore, numerous gaps and opportunities exist to deepen our understanding of its complex issues. In this scientific article, we have chosen to focus on the impact of infrastructure and entrepreneurship support programs on women's entrepreneurship in emerging economies. This choice is motivated by a series of arguments:

Firstly, the need for research in emerging and developing economies. It is essential to delve into this question in these economies to test and analyze the dynamics specific to these regions and to understand the social and cultural challenges faced by women entrepreneurs in these contexts. It is worth noting that the literature predominantly reveals studies on women's entrepreneurship in Western and developed countries. The active participation of women in economic growth and the development of their businesses needs exploration in emerging countries. This necessitates researchers to explore women's entrepreneurship in the long term, beyond the initial phase of entrepreneurial intention. Hence, the use of the TEA_feminin proxy developed by the GEM.

Secondly, taking into account the diversity of women entrepreneurs in the context of emerging economies can only contribute to enriching the existing theoretical contributions. This should consider variables such as types of infrastructure and their specificities, along with political, institutional, and cultural practices. This critical reflection should also consider the gender variable and its particularities. The heterogeneity of women entrepreneurs is no longer a variable to underestimate in the understanding of the dynamics of female entrepreneurship. Recognizing gender identities and their heterogeneity in the study of female entrepreneurship is particularly crucial when designing programs and policies tailored to women entrepreneurs. This is due to the need for personalized approaches to support the dynamics and success of female entrepreneurship. Funding,

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infrastructure, and entrepreneurship support programs promote access to material and immaterial resources for women entrepreneurs. Of course, all of this is within the framework of promoting gender equality and the pursuit of economic growth combined with the socioeconomic inclusion of women in emerging countries. These are indeed the objectives of sustainable development.

This paper will be structured as follows: a literature review (Section 1), methodology and data (Section 2), empirical results (Section 3), and a discussion of the results (Section 4).

2. Literature

2.1. Macro-environment & Institutional/Urban Support

Politics, law, culture, and religion combine with economics to form a macro-environment for entrepreneurs [1]. The variables of the macro-environment, favoring or hindering entrepreneurship (both male and female), play a crucial role in the decision-making process of entrepreneurs, as well as public policymakers interested in promoting entrepreneurship [2]. Particularly in the context of emerging economies characterized by institutional fragility and limited resources, there is insufficient evidence to determine whether the macro-environment promotes or hinders entrepreneurship (both male and female) [3]. For example, [9] and [10] provide evidence that macro-environment variables offer supportive mechanisms to promote the development of entrepreneurship (both male and female). On the other hand, [4] and [5] argue that support programs, especially in economically developing regions, have been criticized for being ineffective and lacking gender sensitivity. This debate raises the question posed by [6]: "What types of entrepreneurship support policies are useful for urban areas and why?" [7]. From a public policy perspective, policymakers are more focused on measures to support entrepreneurship dedicated to urban agglomerations. Establishing the foundations of an entrepreneurial ecosystem is more than ever a political priority [8]. Location-based growth accelerators serve as a notable example [9]. However, the urgency lies in considering the regional dimension. Developing specific policies for entrepreneurial activities unique to each urban area is even more critical. This reflects the adoption by decision-makers of theoretical and empirical contributions that support the idea that regional economic growth can not only be an important effect of entrepreneurial activities but also a cause of them [10].

Due to the absence of a comprehensive theory on urban entrepreneurship in the academic realm, there has been a significant adaptation of other theoretical models to make them compatible [11]. This explains the presence of adapted models within the academic field of entrepreneurship. This includes new models of economic geography by Krugman, urban economies by Jacobs, regional growth theory, Richard Florida's concept of the creative class, network theory, and Marshall's agglomeration theory. The notion of space is increasingly recognized as a determinant of entrepreneurial dynamics. The diversity of scales in entrepreneurship studies demonstrates this. The spatial-entrepreneurial dynamics cover four levels: supranational, national, regional, and local [12].

Urbanization economies, which generate intersectoral links, diversified labor markets, and substantial-sized sectors and industries, are correlated with the spatial concentration of businesses [13]. The debate on the link between urbanization economies and entrepreneurship is based on the postulate that a higher level of entrepreneurship is strongly correlated with low fixed costs and a higher number of entrepreneurs [14]. This is primarily the case for "Pull" entrepreneurship. Given this correlation, urban economic dynamics can serve as a positive impetus for potential entrepreneurs. Theoretically, it can be expected that the importance of entrepreneurial impetus depends more on the size and characteristics of the urban space. Jacobs' externalities are among the explanations for these correlated economic dynamics. Such externalities are characteristic of the early stages of an industry's life cycle and subsequently promote the emergence of new companies, which are also relatively significant during the genesis of an industry [15].

The urban spatial dimension theoretically offers entrepreneurial opportunities for entrepreneurs: heterogeneity, availability of information, and the diversity of large urban economies present a pulling force for entrepreneurship [13]. This suggests that the process of urbanization can support entrepreneurial dynamics through urbanization economies [16], availability of information [17], reduced transaction costs, proximity to entry and exit markets, available infrastructure, and consequently, the quality of connectivity and communication [16]. Within the urban space, one can benefit from the diversity of skills and achieve cost savings in labor [18]. Although there are opposing forces in urban space, such as high entry costs due to increasing demand for resources, economies of scale make entrepreneurial projects more profitable given the potential market size.

When viewed through a gender lens, researchers may wonder if this holds theoretically for entrepreneurship in general in developed economies, and whether it applies to women's entrepreneurship in emerging economies. Do these women entrepreneurs, with their specific characteristics, benefit equally from the advantages offered by urban space? Do they have the same opportunities in terms of access to financing, infrastructure, entrepreneurship support programs, and technology?

2.2. The Environment of Female Entrepreneurship: Theoretical Debates & Hypotheses

Combining organization, project development, and sometimes even product and/or service innovation, female entrepreneurship typically takes the form of creating businesses by one or more women [19, 20]. When comparing it to its male counterpart, one cannot overlook the differences between the two [21, 22]. Several scientific contributions highlight these differences between masculinity and femininity on various levels [23]. These differences involve the amount and structure of capital as well as the choice of industry [24]. Regarding the identification of entrepreneurial opportunities in the digital era, unequal access to infrastructure, particularly digital networks, disadvantages women [25]. To this day, in a significant portion of emerging economies, the burdensome application procedures and insufficient loan supply hinder access to financing through loans for many women in these countries [26, 27]. Efforts made in the field of online finance have reduced disparities in this regard, but the problem remains unresolved [28]. In terms of digital infrastructure and peer-to-peer (P2P) finance, they could pose a major challenge for policymakers to ensure that regulations keep pace with this new form of finance.

Particularly in these emerging economies, it would be unfair to generalize the findings of research on male entrepreneurship to female entrepreneurship [29]. Therefore, a contextualized study on female entrepreneurship is more necessary than ever in developing countries. Contextualization allows for the interpretation of interrelationships linking female entrepreneurship to the social, spatial, and institutional dimensions of its environment [30]. This is especially urgent for emerging countries that align with the Sustainable Development Goals (SDGs), particularly SDGs 5, 8, 10, and 17. In their pursuit of these goals, decision-makers strive to create an ecosystem favorable to female entrepreneurship by strengthening the institutional support system for this type of entrepreneurship. Eliminating constraints to accessing credit, facilitating access to infrastructure, reducing regulatory complexities, and implementing other measures are adopted to ensure the effectiveness of public programs supporting female entrepreneurship. In the context of this scientific debate, we aim to contribute to the theory of entrepreneurship by testing the following hypotheses:

- H1a: Entrepreneurial finance promotes the Women/Men TEA Ratio.
- H1b: Entrepreneurial finance does not promote the Women/Men TEA Ratio.
- H2a: Hypothesis: Government policies supporting entrepreneurship have a positive influence on the Women/Men TEA Ratio.
- H2b: Hypothesis: Government policies supporting entrepreneurship do not influence the Women/Men TEA Ratio.
- H3a: Hypothesis: Government programs supporting entrepreneurship have a positive influence on the Women/Men TEA Ratio.
- H3b: Hypothesis: Government programs supporting entrepreneurship do not influence the Women/Men TEA Ratio.
- H4a: A strong commercial and legal infrastructure is positively correlated with a high level of the Women/Men TEA Ratio.
- H4b: A strong commercial and legal infrastructure is not positively correlated with a high level of the Women/Men TEA Ratio.
- H5a: Adequate physical infrastructure is positively correlated with a high level of the Women/Men TEA Ratio.
- H5b: Adequate physical infrastructure is not positively correlated with a high level of the Women/Men TEA Ratio.

3. Methodology and Data

The data collection methodology by GEM focused on large urban areas where the surveyed populations resided at the time of the study. Urban areas were defined using the concept of "functional urban areas" (PETERS, 2011), which encompass larger areas than city centers and are widely studied in the specialized literature on urban planning. Regarding the variables used, we selected the Women/Men TEA Ratio as the dependent measure. This ratio, used by GEM, represents the percentage of women aged 18 to 64 who are

either nascent entrepreneurs or owner-managers of a "new business," divided by the equivalent percentage for men in the same age group.

The explanatory variables, on the other hand, include the following elements:

- **Financing:** This variable measures the availability of financial resources for small and medium enterprises (SMEs). This includes equity, debt, as well as other sources of funding such as grants and financial assistance.
- **Government policies:** We evaluate the level of support from public policies towards entrepreneurship by examining two aspects:
 - **Aspect 1:** Recognition of the economic importance of entrepreneurship.
 - **Aspect 2:** The impact of taxes, bureaucracy, and regulations that are supposed to be neutral or favorable to new businesses and SMEs.
- **Entrepreneurship support:** We take into account the presence and quality of direct assistance programs for SMEs.
- **Commercial and professional infrastructure:** This variable examines the presence of a robust infrastructure to support businesses, including the protection of property rights, availability of business, accounting, and legal services, as well as the presence of institutions that promote and support SMEs.
- **Physical infrastructure:** We evaluate the ease of access to physical resources necessary for businesses, such as communication infrastructure, utilities, transportation, land, or space. The objective is to determine if these resources are readily available and accessible at a reasonable price for SMEs without discrimination. Nowadays, physical infrastructure and the Internet provide facilities and services used for communication and obtaining the necessary information for entrepreneurship.

4. Empirical results

4.1 Stationarity

The unit root test table (Table 1) provides the results of the stationarity of the variables. Thus, at level, all the variables generally exhibit non-stationary behavior when tested without, with a constant term, and even with a constant term and a trend. However, when differenced once, all the variables show stationary behavior with a 5% threshold.

Table 1: Stationarity of variables

UNIT ROOT TEST TABLE (PP)					
TEA_Fem/Mal	PHS_INFR	INFR_CP	GUVSUP	GOVPROG	FINC
I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

4.2 The PMG-ARDL Model

Table 2: Long Run coefficients

Variable	Long Run Equation		
	Coef	Std. Error	Prob.*
GOVPROG	0.284249	0.057916	0.0000
GUVSUP	-0.155308	0.028551	0.0000
FINC	-0.047714	0.033191	0.1592
INFR_CP	-0.141613	0.049059	0.0065
PHS_INFR	0.128389	0.030575	0.0002

- **D(GOVPROG):** The positive coefficient (0.284249) indicates that increased support of government policies for entrepreneurship is associated with an increase in the dependent variable (Women/Men TEA). This suggests that recognizing the economic importance of entrepreneurship and implementing favorable policies for new

businesses and SMEs can have a positive impact on the Women/Men TEA ratio. Furthermore, the coefficient is statistically significant, which strengthens this conclusion.

- D(GUVSUP): The negative coefficient (-0.155308) suggests that an increase in direct support to SMEs may be associated with a decrease in the Women/Men TEA ratio. This might be surprising, but it is important to note that the coefficient is statistically significant. This may indicate that the presence or quality of direct assistance programs for SMEs can have complex effects on female entrepreneurship.
- D(FINC): Although the coefficient is negative (-0.047714), it is not statistically significant (Prob. = 0.1592) at a 95% confidence level. This means that the availability of financial resources for SMEs, measured by the FINC variable, has not been shown to have a significant relationship with the Women/Men TEA ratio in the studied sample.
- D(INFR_CP): The negative coefficient (-0.141613) indicates that a strong commercial and professional infrastructure is associated with a decrease in the Women/Men TEA ratio. Furthermore, the coefficient is statistically significant, reinforcing this conclusion. This suggests that the presence of a solid infrastructure to support businesses, including the protection of property rights and availability of commercial, accounting, and legal services, does not directly and positively impact female entrepreneurship.
- D(PHS_INFR): The positive coefficient (0.128389) indicates that improved accessibility to the physical resources necessary for businesses is associated with an increase in the Women/Men TEA ratio. This may include factors such as access to communication infrastructure, public services, transportation, and land. Furthermore, the coefficient is statistically significant, further supporting this conclusion.

Table 3: Short Run coefficients

Variable	Short Run Equation		
	Coefficient	Std. Error	Prob.*
COINTEQ01	-1.127012	0.236542	0.0000
D(GOVPROG)	-0.330191	0.177473	0.0710
D(GUVSUP)	0.121505	0.205691	0.5584
D(FINC)	-0.039334	0.157147	0.8038
D(INFR_CP)	0.005059	0.110827	0.9638
D(PHS_INFR)	-0.074253	0.075285	0.3306
C	0.678029	0.148743	0.0001

In the short term, the coefficients are not significant, as illustrated by the following details:

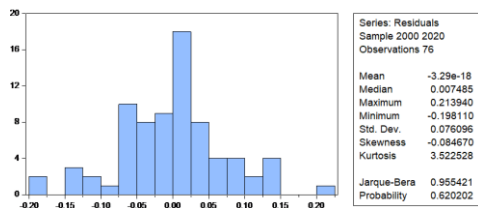
- D(GOVPROG): The coefficient is -0.330191 with a standard error of 0.177473. The associated probability value is 0.0710, which is slightly above the significance threshold of 0.05. This indicates that D(GOVPROG) may affect the dependent variable, but it is not statistically significant in the short term at this level of confidence.
- D(GUVSUP): The coefficient is 0.121505 with a standard error of 0.205691. The associated probability value is 0.5584, which is well above the significance threshold of 0.05. Therefore, D(GUVSUP) does not have a significant effect on the dependent variable in the short term.
- D(FINC): The coefficient is -0.039334 with a standard error of 0.157147. The associated probability value is 0.8038, which is well above the significance threshold of 0.05. Thus, D(FINC) does not have a significant effect on the dependent variable in the short term.
- D(INFR_CP): The coefficient is 0.005059 with a standard error of 0.110827. The associated probability value is 0.9638, which is well above the significance threshold of 0.05. This suggests that D(INFR_CP) does not have a significant effect on the dependent variable in the short term.
- D(PHS_INFR): The coefficient is -0.074253 with a standard error of 0.075285. The associated probability value is 0.3306, which is above the significance threshold of 0.05. This indicates that D(PHS_INFR) does not have a significant effect on the dependent variable in the short term.

4.3 Robustness Test:

Tests of residual normality are used to check if the residuals of a statistical model follow a normal distribution. Here is the interpretation of the residual normality test results:

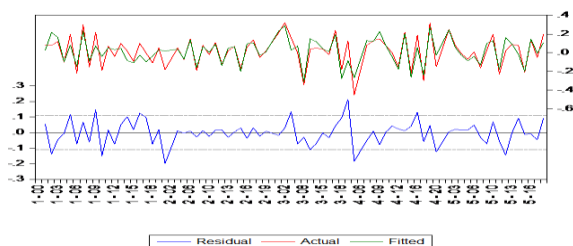
- Skewness: The value of -0.084670. For a normal distribution, the skewness coefficient should be close to zero.
- Kurtosis: The value of 3.522. A kurtosis value higher than 3 suggests a distribution more concentrated around the mean with thicker tails.
- Jarque-Bera Test: The value of 0.955421. In this case, the value is above zero, suggesting that the residuals are close to a perfectly normal distribution.
- Probability: The value of 0.620. This is the probability that the residuals are normally distributed. In this case, the probability is relatively high (62%), suggesting that the residuals can be considered approximately normal despite slight deviations from the normal distribution.

Fig1: Residuals normality test



To confirm the robustness of our model, it is necessary to visually compare the graphs of the fitted model to the actual values. This observation reinforces the idea that the model is appropriate and provides consistent estimates. Indeed, examining the graph of the fitted model about the actual values reveals a close correspondence between the two, suggesting that the relationships between the independent variables and the dependent variable are well captured. The graphs exhibit a distinct visual similarity, indicating that the model is capable of accurately reproducing the observed variations in the real data. As for the residuals, our goal is to determine if they approach zero. Residuals close to zero indicate that the model can explain most of the variations in the dependent variable using the independent variables included in the model. This also suggests that the residual errors of the model are minimal, thereby reinforcing the validity of its estimates. The visual similarities between the fitted model and the actual data strengthen confidence in the model's ability to accurately predict the dependent variable.

Fig2: Quality of adjustment



5. Discussion & Implications

In this research, we have examined various hypotheses regarding the impact of entrepreneurial finance, government policies supporting entrepreneurship, government support programs, commercial and legal infrastructure, as well as the physical infrastructure on the Women/Men TEA Ratio. Overall, the results confirm the importance of considering these different environmental and institutional factors when formulating policies aimed at promoting female entrepreneurship. Thus, the findings provide empirical evidence regarding the impact of various factors on the Women/Men TEA Ratio. Government policies supporting entrepreneurship and government support programs do not have the same meaningful impact in explaining this ratio. However, a robust commercial and legal infrastructure has shown a significant negative correlation, while adequate physical infrastructure has shown a significant positive correlation with the Women/Men TEA Ratio.

Regarding our research hypotheses, as illustrated in the table 4 some have been confirmed while others have not, for example, entrepreneurial finance. We cannot significantly conclude the impact of this variable on the Women/Men TEA Ratio as the corresponding coefficients are not significant.

Table 4 : Short Run coefficients

	Long run coeff	Short run coeff	Impact
H2.b	confirmed	Unconfirmed	Negatives
H3.a	confirmed	Unconfirmed	Positif
H4.b	confirmed	Unconfirmed	Negatives
H5.a	confirmed	Unconfirmed	Positif

Note: (--) indicates that the coefficients are not statistically significant.

Thus, for government policies supporting entrepreneurship, we were able to confirm their significant negative influence on the Female/Male TEA Ratio. On the other hand, government programs supporting entrepreneurship demonstrated a positive and significant influence on the Female/Male TEA Ratio. Furthermore, our results confirmed a significant negative correlation between a strong commercial and legal infrastructure and the Female/Male TEA Ratio. This suggests that when the commercial and legal infrastructure is strong, it does not promote a high level of the Female/Male TEA Ratio. Additionally, we found a significant positive correlation between adequate physical infrastructure and the Female/Male TEA Ratio, thus supporting our initial hypothesis. These results suggest that adequate physical infrastructure promotes a high level of the Female/Male TEA Ratio.

6. Conclusion

Considering the results of our research along with the references mentioned in our literature review, it is essential to recognize that the contexts of emerging economies present particular challenges for promoting entrepreneurship, especially female entrepreneurship. In line with the existing debates in the literature, our findings also highlight divergences regarding the effectiveness of entrepreneurship support policies. Some researchers emphasize the support mechanisms provided by the macro-environment, while others criticize the inefficiency and lack of gender sensitivity of these support programs. Such controversy raises the question of the relevance of specific policies for each urban area and the importance of considering the regional dimension in supporting policies for female entrepreneurship.

Our results emphasize the importance of tailored public policies for urban and regional contexts to foster female entrepreneurship. It is necessary to take into account the specificities of the macro-environment, as well as the opportunities offered by the urban space, to implement effective and gender-sensitive policies. Future research should delve into these issues.

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