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WOMEN-OWNED ENTERPRISE AND THEIR EFFICIENCY: Evidence from the Jeevika Programme in Bihar

Ajit Kumar Jha, Rahul Ranjan, and Sushant Gaurav[*]

Abstract: *Female entrepreneurship is increasingly recognized as a key driver of inclusive growth. Promoting women's entrepreneurship helps not only in gender equality but also contribute to productive growth, employment creation and structural transformation. In India, the relatively low participation of women in economic activities has long been a matter of concern. However, recent improvement in female labour force participation and growing share of women-owned enterprises indicates positive changes in economy. Bihar, despite being a one of India's relatively less developed states has witnessed a remarkable growth in female-headed enterprises over the past one and half decades. Against this backdrop, the present the present study examines the progress of women-owned enterprises in Bihar and investigates the role of the Jeevika programme in enhancing enterprise performances. This study estimates technical efficiency using a stochastic production frontier model and examines the role of program intensity using unit-level data from the 2023–24 Annual Survey of Unincorporated Sector Enterprises (ASUSE). The findings reveals that women-owned enterprises operate at an average level of technical efficiency of 71.2 per cent, suggesting significant potential for gains in productivity through better use of resources already available. The results further indicate that intensity of Jeevika programme is significantly related to lower technical inefficiency implying that access to credit, training and social networks improves entrepreneurial capabilities and resource utilisation. The findings have serious implications for policies to encourage women's entrepreneurship and inclusive economic development.*

Keywords: *Women Enterprise, Jeevika Scheme, Self Help Group, Stochastic Frontier Analysis, Bihar*

JEL Classification: *E26, L26*

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1. Introduction

Entrepreneurship is widely recognized as a key driver of economic growth, employment generation and poverty reduction. Focusing on women's entrepreneurship has been not only a matter of gender equality in economic space but also an indicator of inclusive growth, which helps in economies of scale, decent employment creation, local economic development and structural transformation (Nagler & Naudé, 2017; Bimardhika & Halim, 2023: Chiplunkar & Goldberg 2024). Nevertheless, women entrepreneurs, as they are becoming more and more important, continue to be constrained by deep-rooted structural constraints that hinder enterprise growth, productivity and long-term sustainability (Bruhn & McKenzie, 2014). Factors such as limited mobility, lower levels of education, restricted ownership of productive assets, and inadequate access to finance affect the growth and productivity of enterprises (Kabeer, 2012; World Bank, 2022). Therefore, despite the rising participation of women in entrepreneurial activities, there remain significant gender gaps in enterprise performance, profitability, and productivity. The past two decades have witnessed a large amount of scholarly interest in the relationship between female entrepreneurship and economic development (Minniti & Naudé, 2010). Initial studies focused on improving women's participation in self-employment as a poverty reduction tool. More recently, attention has shifted to the quality and efficiency of women-led enterprises and not simply their existence (Campos et al., 2017; McKenzie & Woodruff, 2017). Many women have businesses that are concentrated in low-productivity sectors characterized by low capital intensity, small market reach, and low returns to labour (Rejeb, Rejeb & Süle, 2025; Mumtaz & Ahmad, 2026). Thus, the determinants of enterprise efficiency have become a key problem in the economics and policy of development.

Despite robust economic growth in past three decades, female entrepreneurship remains significantly lower than male entrepreneurship despite substantial improvements in women's education and increasing policy attention toward gender-inclusive development (Kapsos, Bourmpoula & Silberman, 2014; World Bank, 2025). Estimates shows that women-owned enterprises are disproportionately concentrated in the micro and informal sectors characterized by low productivity, limited capital and restricted growth potentials. Studies shows that women face multiple constraints including social norms (majorly impacts women's mobility and access to services), access to credit, weak business network and burden of unpaid domestic work and care (Carranza et al, 2018). Further, the literature focusing on gender gap provides evidence that women-owned enterprises are less productive and profitable than male-owned enterprises even after controlling for observable characteristics such as education and access to finance (Chaudhari et al, 2020: Gang et al., 2022; Deshpande & Sharma, 2024). These differences reflect the underlying structural inequalities embedded in the social and economic institutions of India.

The state of Bihar in the above context provides an important background to the prospects and challenges of women entrepreneurship in state having huge potential given the

demographic structure and policy focus of the government. Traditionally, Bihar has been characterised by high levels of poverty, low industrialisation, low female labour market participation and deep-rooted patriarchal norms (Pankaj, 2020). At the same time, the state has made great strides to increase women's economic participation through large-scale, community-driven development initiatives. The Jeevika program, formally called the Bihar Rural Livelihoods Project, is one of the most successful rural development interventions in South Asia (BRLPS, 2024). The Jeevika programme aims at organising rural women into community institutions, enabling access to financial services and strengthening livelihood opportunities and social capital (Hancock, Penumaka & Takada, 2017). Jeevika has mobilised millions of rural women across Bihar through federated networks of self-help groups, village organisations and federations at cluster level. The programme seeks to promote not just financial inclusion but also entrepreneurship, skill development, market integration and livelihood diversification (Sanyal, Rao & Majumdar, 2015). Increasing numbers of women participating in Jeevika have set up micro-enterprises in the areas of agriculture, livestock, food processing, handicrafts, retail trade and services (Datta, 2015). While there are studies that have documented the positive effects of the programme on financial inclusion, household welfare, social empowerment and livelihood diversification, the efficiency of enterprises established and managed by Jeevika members is largely unknown (Siwach, Hoop & Belyakova, 2020). Most of the assessments measure indicators of participation, access to credit, income augmentation or empowerment, while leaving open questions about enterprise performance and use of resources (Hoffmann et al., 2018).

This is a major gap in both policy and academic literature. Understanding whether women-led enterprises supported through collective action and livelihood interventions are able to operate efficiently is of importance to assess the sustainability and developmental effectiveness of such programmes. The study makes several important contributions to the literature. First, it shifts the focus from the level of enterprise participation to the level of enterprise efficiency, thus addressing a critical yet understudied dimension of women's entrepreneurship. Secondly it contributes empirical evidence from one of the largest women focused livelihood programmes in the world to the ongoing debates on effectiveness of community driven development interventions. Third, the study of Bihar, a region with historically low levels of female economic participation, sheds light on the role of institutional support mechanisms in shaping entrepreneurial outcomes in highly constrained environments.

2. Data Methods

The study draws on following major source of information. The unit level enterprise data is obtained from the National Sample Survey Organization (NSSO) 73rd Round Survey on Unincorporated Non-Agricultural Enterprises (2015-16) and the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24). Both surveys offer extensive data on

unincorporated non-agricultural enterprises in India, encompassing manufacturing, trade, and service sectors, and is especially adept at analysing micro and small enterprises, including own-account enterprises (OAEs) and establishments with hired labour. The employment specific information of female workers is sourced from the Periodic Labour Force Survey (PLFS) for the years 2017-18 and 2023-24. The PLFS provides detailed labour market information, including workforce participation, employment status, and sectoral distribution of workers. To access the outreach of Jeevika programme in Bihar, district-level information on the number of operational self-help groups (SHGs) is used and integrated with the ASUSE (2023-24) microdata to assess exposure to the Jeevika programme. The analysis is confined to women owned enterprises in Bihar. Bihar is a particularly relevant context as it is home to one of the largest women-centered livelihood programmes in the world, Jeevika, which is implemented through a network of Self-Help Groups (SHGs). The programme aims to improve women's economic participation through access to credit, training, capacity building and collective action. We eliminated observations with missing information on output, capital, labour and other key variables. The final sample for analysis is 25,391 women-owned enterprises. The large number of observations allows us to estimate both determinants of enterprise performance and technical efficiency measures in a robust way. Finally, district-wise data on registered female voters collected from Election Commission of India, which serve as a proxy for the adult female population in Bihar and used to calculate Jeevika Intensity in the study.

3. Theoretical Perspective of Women Enterprises

The analysis of enterprise efficiency among women entrepreneurs participating in the Jeevika programme is based on three complementary theoretical perspectives: Human Capital Theory, Capability Approach and feminist theories of entrepreneurship. The Human Capital Theory developed by Becker in 1964 is the first pillar of the framework. The theory emphasises the role of education, knowledge, skills and experience in significantly improving economic performance and output. This theory suggests that investment in human capital increases individuals' ability to collect, process and utilise information. This leads to more effective decision making and resource allocation. Several studies in developing countries have found that entrepreneurs with higher levels of human capital tend to run more productive and profitable businesses. However, women in rural areas are sometimes constrained in their access to education and skills, which limits their access to the full range of economic options. Programmes such as Jeevika try to bridge these gaps through capacity building, training and information dissemination. The Human Capital Theory is particularly useful in explaining the differences in efficiency of enterprises among the program participants. The theory explains the differences in output due to individual skills, but does not explain the reasons for people with similar resources ending up with different economic outcomes. To overcome this limitation, the study uses Sen's Capability Approach (Sen, 1999) that shifts the focus from ownership of resources to the ability of individuals to convert resources into valued achievements. This view is that

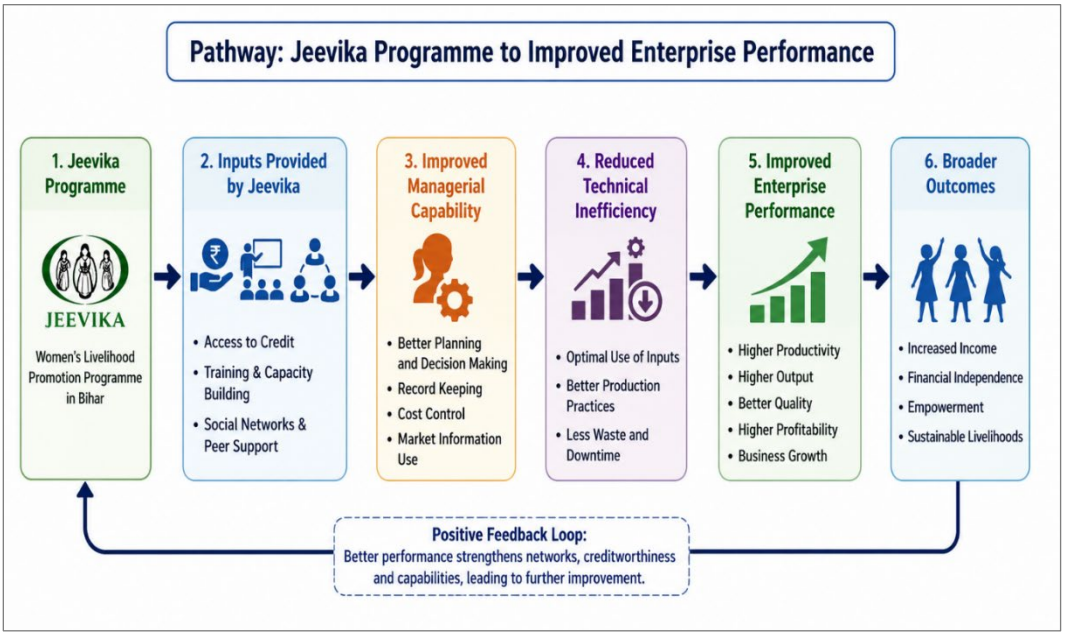
progress should be seen as the improvement of substantive freedoms that allow people to live lives that they value. In the domain of women entrepreneurs, access to capital, training or productive assets does not necessarily lead to improved performance of the firm. Women enterprises need autonomy, confidence and social independence to make effective use of these resources. The mobility restrictions, time constraints due to unpaid care work and limited power to make decisions can greatly limit women's ability to translate resources into productive outcomes. The Capability Approach stresses the need to assess not just the availability of entrepreneurial resources but also the social and institutional factors that shape women's ability to use them effectively.

The third pillar of the framework is feminist and gendered theories of entrepreneurship which question the notion that entrepreneurial performance is determined solely by human characteristics and market incentives. These perspectives suggest entrepreneurship is embedded within larger contexts of social relations, power and gender norms (Ahl, 2006; Brush et al., 2009). Women's firms usually operate under very different conditions from men's, suggesting unequal access to property rights, financial services, business networks, markets and institutional support. Furthermore, women's entrepreneurial choices are often shaped by their responsibilities associated with household reproduction and caregiving, which impact the size, choice of sector and growth trajectory of their businesses (World Bank, 2018). Feminist scholarship argues that differences in enterprise performance are not just individual failures but are embedded in the social and economic institutions and are the results of structural inequalities (Agarwal, 1997; Kabeer, 1999; Elson, 1999; Ahl, 2006). These structural constraints are important for assessing the performance of women-led firms in rural Bihar, where patriarchal norms are still strong.

Collectively, these three perspectives provide a holistic framework for assessing enterprise efficiency of Jeevika participants. The Human Capital Theory deals with the impact of knowledge and skills, the Capability Approach focuses on the significance of agency and the ability to convert resources into economic success, and feminist theories point out gendered institutional and social barriers to entrepreneurial opportunities. The inclusion of these perspectives takes the study beyond narrow economic interpretations of firm performance and positions women's entrepreneurship in wider contexts of empowerment, social transformation and inclusive development. Such an integrated approach is especially relevant for livelihood programmes such as Jeevika which aims not only at income generation but also at enhancing women's capabilities, agency and economic participation.

Based on above theories, the study proposes that Jeevika influences enterprise performance indirectly through capability enhancement. The programme provides access to credit, training and social networks, which strengthen the managerial capacity of women entrepreneurs. Improved managerial capability leads to more efficient use of available resources, reducing technical inefficiency and thus improving enterprise performance. The conceptual framework of the empirical analysis is presented in Figure 1.

Figure-1: Conceptual Framework of Jeevika Programme Participation



Source: Drawn by Authors.

4. Women's Participation in Employment and Ownership

Women's participation in employment and enterprise ownership continues to be an important measure of economic empowerment and inclusive development in the state of Bihar and in the country as a whole. India has made considerable progress in terms of female labour force participation in recent years, yet the level is still lower than that of men. This is mainly due to socio-cultural norms, unequal access to education and skills, unpaid care duties and limited job opportunities. Women are a large part of the workforce, predominantly in low-paid informal jobs, especially in agriculture, domestic work and self-employment. Bihar has a unique position in the Indian context. Historically, the state has lagged behind the nation as a whole in the proportion of women in the work force. This is indicative of the constraints associated with educational levels, mobility, access to financial resources, and patriarchal social norms. However, several government programmes and livelihood initiatives, most notably the Bihar Rural Livelihoods Project (JEEViKA) have helped in increasing the economic participation of women through self-help organisations, microfinance and development of entrepreneurial activities. The implementation of these initiatives has enabled a great number of women to start their own businesses and participate in money-making activities.

Low economic participation of women has been a major concern in India's development agenda. Female participation in India was largely driven economic necessity and household insecurity rather than better job opportunities and higher wages (Klasen and

Pieters, 2012). In case of Bihar also female labour force participation (FLPR) was quite low and it consistently declined between 2004-05 and 2018-19 (Pandey, 2023). The turnaround came in past decade which led to significant rise in female workforce in India. Estimation based on PLFS data shows that at all India level proportion of female workers increased from 25.3 per cent in 2017-19 to 45.2 percent in 2023-24. The rise was much higher in case of Bihar (4.4 % to 30.0 % during this period). The share of female workers in Bihar's total workforce increased by 23 percent from 5.6 % in 2017-18 to 28.3 % in 2023-24. Table-1 presents a comparison of female participation indicators. The FLFPR is Bihar is below the national average across all age groups. A large proportion of women (43.5 %) are still engaged in agriculture sector. Women's share in Bihar's non-agricultural sector is only 11.3%, compared to 22.3% nationally. However, women's share in manufacturing is 39.7 per cent, significantly higher than the national average (33.4%).

Table-1: Female Participation Indicators in Employment (Usual Status Basis) (Per Cent)

Indicators	*Youth (15-29)*	*Working (15-59)*	*All*	*Youth (15-29)*	*Working (15-59)*	*All*
All India	**2017-18**			**2023-24**		
FLFPR	16.4	25.3	17.5	28.3	45.2	30.7
Women's share in agriculture sector			29.9			47.9
Women's share in non-agriculture sector			22.3			22.3
Women's share in manufacturing sector			23.0			33.4
Women's share in services sector			14.7			23.1
Bihar						
FLFPR	1.7	4.4	2.8	14.7	30.0	20.0
Women's share in agriculture sector			6.6			43.5
Women's share in non-agriculture sector			4.9			11.3
Women's share in manufacturing sector			2.3			39.7
Women's share in services sector			7.7			12.9

Source: Authors' Estimation Based on PLFS Unit Record Data

According to Golar and Agrawal (2025), the significant rise of women in manufacturing reflects a trend of feminization of industrial workforce. Using the same data sets the paper shows that between 2017-18 and 2023-24, women accounted for about 74 per cent of the increase in manufacturing employment, a much higher increase compared with only 22 percent during 1999-00 and 2011-12. The paper further argue that the rise is female employment is closely linked to the rise of female-owned enterprises in manufacturing

sector. Table-2 presents the gender wise ownership structure of enterprises in Bihar and India. It indicates a gradual rise of women entrepreneurship in India. At all India level, the share of female-owned enterprises increased from 19.5% in 2015-16 to 25.8% in 2023-24. Comparing this figure with Bihar shows a much a higher rise in female entrepreneurship during this period. The share of female-owned enterprises in Bihar increased mor than fourfold, from 4.9 percent in 2015-16 to 20.9 percent in 2023-24. This led to Bihar's increased share in female entrepreneurship which increased from 1.4 percent in 2015-15 to 4.6 percent in 2023-24. In 2015, 94% of enterprises in Bihar were owned by men and only 4.9% of enterprises were owned by women.

Table-2: Enterprise Status of India and Bihar and % Share of Bihar

	2015-16	*2023-24*
India (In %)		
% of Male Proprietary	76.4	69.1
% of Female Proprietary	19.5	25.8
Bihar (In %)		
% of Male Proprietary	94.0	78.1
% of Female Proprietary	4.9	20.9
% Share of Bihar in India's Male Proprietary	6.7	6.5
% Share of Bihar in India's Female Proprietary	1.4	4.6
% Share of Bihar in India' Total Enterprises	5.4	5.7

Source: Author's Estimation using Unincorporated Non-Agricultural Enterprises (2015-16), the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).

A more disaggregated sectoral analysis shows a substantial rise in women entrepreneurship in manufacturing sector. Much of this growth has happened in states like Bihar, Rajasthan, Madhya Pradesh and Jharkhand. At the national level, the share of female-owned enterprises rose from about 45 per cent in 2015–16 to 55 per cent in 2022–23. The change was even more pronounced in Bihar, where the share of female-owned enterprises increased from 4.7 per cent in 2010-11 to 45.5 per cent in 2023-24. It has also been observed that the share of female-owned enterprises has increased in garments, food processing, textiles, leather and chemical sectors which require largely low-skilled workers and the entry barriers in these sectors are relatively low (Ministry of MSME, 2024).

Such a structural transformation in Bihar may be attributed to the state's sustained economic growth over the past two decades, along with a range of policy interventions aimed at enhancing women's access to education and economic opportunities. Initiatives such as the Jeevika programme, which emphasized the formation of self-help groups and promoted women's social and economic inclusion, appear to have played an important role in reshaping the state's entrepreneurial landscape. However, the extent to which this transformation has been translating into productive, growth-oriented entrepreneurship

remains an open question. Further analysis is needed to assess the efficacy and determinants of this female-owned entrepreneurial growth in Bihar.

5. Determinants of Female Owned Enterprises

The study employs a binary logit model to examine the determinants of women-owned enterprises in Bihar. The dependent variable is equal to one if the enterprise is woman-owned, zero otherwise. The model estimates the log-odds of women's enterprise ownership as a function of programme exposure, enterprise characteristics and socio-economic factors, consistent with standard applications of discrete choice models (McFadden, 1974; Greene, 2012). Logistic regression is suitable for this case as the dependent variable is dichotomous and the results can be interpreted as probabilities (Hosmer & Lemeshow, 2000). The main explanatory variables include the Jeevika intensity, a measure of the degree of exposure to the state's flagship livelihood programme based on self-help groups to account for structural changes in the post-implementation period (World Bank, 2022). In impact evaluation studies, programme exposure variables are often used to measure the efficacy of policy interventions on economic outcomes (Duflo, 2001).

Individual and household characteristics are represented by categories of Jeevika Intensity[1], educational attainment, with illiterate women as the reference group. This is in line with human capital theory that education is a critical determinant of entrepreneurial outcomes (Becker, 1964). Enterprise-level controls include type of enterprise, location of operation, sectoral composition and age of enterprise. In particular, heterogeneity in enterprise structure is captured by the inclusion of own-account enterprises, enterprises with different location types, engagement in manufacturing or service activities and enterprise age categories.

Social group indicators are included to investigate caste-based disparities with Scheduled Castes and Scheduled Tribes as the reference category, reflecting well-documented structural inequalities in access to economic opportunities in India (Beteille, 1991). The model is estimated by maximum likelihood techniques, which yield consistent and efficient estimates of the parameters for binary choice models (Wooldridge, 2010). The estimated coefficients are interpreted as marginal effects on the log odds of women's enterprise ownership. We cluster standard errors at the district level to allow for possible intra-cluster correlation and unobserved heterogeneity at the regional level. Clustering at the district level is common practice in applied econometric analysis (Angrist & Pischke, 2009; Cameron & Miller, 2015). This specification allows for a rigorous assessment of policy-induced and structural drivers of women's entrepreneurship in Bihar.

[1] Jeevika intensity denotes the quantity of self-help groups per ten thousand women registered on the electoral list in Bihar.

Logit Model Equation

Let WE_i be a binary variable that takes the value:

$$WE_i = \begin{cases} 1 & \text{if enterprise } i \text{ is women-owned} \\ 0 & \text{otherwise} \end{cases}$$

Given the binary nature of the dependent variable, the model is estimated using a **logit specification**.

$$\Pr(WE_i = 1) = F(Z_i)$$

where,

$$F(Z_i) = \frac{1}{1 + e^{-Z_i}}$$

and the latent index Z_i is defined as:

Table-3: Logit Model Results

Variable (s)	*Coefficient*	*p Value*	*Margin*	*p Value*
Dependent Variable (Women Enterprises=1 & Others=0)				
Jeevika Intensity	0.0873	0.0260	0.0070	0.0260
Educational Level (Illiterate being benchmark category)				
Upper Primary	-0.5122	0.0000	-0.0469	0.0000
Higher Secondary	-0.7809	0.0000	-0.0686	0.0000
Graduate & above	-0.8483	0.0000	-0.0738	0.0000
Enterprise Type (Hired Worker)				
Own Account Enterprise (OEA)	1.5349	0.0000	0.1068	0.0000
Location of Enterprise (Without Fixed Location being benchmark category)				
With Fixed Location	-1.9360	0.0000	-0.2120	0.0000
Mobile Market without Fixed Location	-2.6991	0.0000	-0.2536	0.0000
Manufacturing Services (No being benchmark category)				
Yes	2.3361	0.0000	0.2810	0.0000
Enterprise Group (Startup being benchmark category)				
Young (1-3 Years)	-0.4775	0.0130	-0.0494	0.0200
Older (More than 3 Years)	-1.3786	0.0000	-0.1250	0.0000
Social Group (ST/SC being benchmark category)				
OBC	-0.1262	0.0760	-0.0103	0.0810
General	-0.1877	0.0550	-0.0152	0.0560
Constant	-1.3074	0.0000		
Number of observations= 25,336 Prob > chi2= 0.0000 Pseudo R2= 0.4272 **VIF = 1.11**				

Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).
*** and ** mean 1% and 5% level of significance.

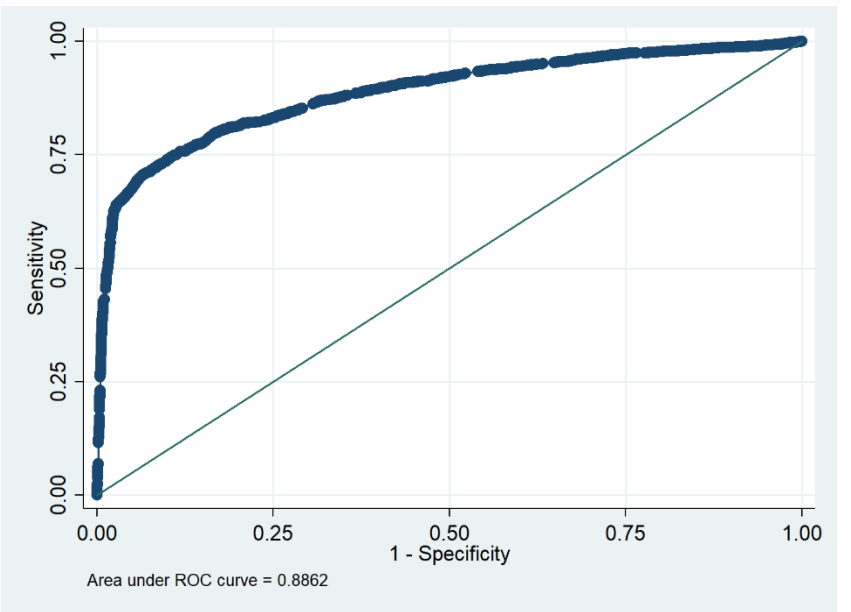
This paper employs the Receiver Operating Characteristic (ROC) and the Classification Accuracy Test to assess the predictive performance of the logit model. The predictive performance of the logit model was evaluated using Receiver Operating Characteristic (ROC) analysis. The area under the ROC curve (AUC) was estimated at 0.8862 (Figure-2), which shows excellent discrimination. This means that in about 91% (table-4) of randomly selected pairs, the model can successfully distinguish between women enterprises and non-women enterprises. The results indicate a high degree of predictive accuracy and support for the adequacy of the model specification. An AUC greater than 0.88 indicates that the model is very good at distinguishing between respondents with women enterprises and non-women enterprises. The model's predictive performance is strongly supported by the AUC (0.8862, figure-2), classification accuracy (91.53%; table-4), and Pseudo R^2 (0.4272; table-3), confirming the model's robustness and discriminatory power.

Table-4: Result of Classification Accuracy Test

Measure	*Value (%)*
Sensitivity (True Positive Rate)	63.07
Specificity (True Negative Rate)	97.41
Positive Predictive Value (PPV)	83.87
Negative Predictive Value (NPV)	92.75
False Positive Rate	2.59
False Negative Rate	36.93
Overall Classification Accuracy	**91.53**

Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).

Figure-2: Receiver Operating Characteristic (ROC) Curve



Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).

Jeevika Intensity

The intensity of Jeevika is quantified by the density of women's self-help groups (SHGs) per ten thousand eligible female voters at the district level, indicating the extent of the program's penetration rather than its simple existence. This method facilitates variability in programme exposure among districts in Bihar. The study examines the determinants of women-owned enterprises in Bihar using the logistics regression model, where the dependent variable is one for women-owned enterprises and zero otherwise. A key variable of interest is the intensity of exposure to the state's flagship self-help group-based livelihood programme, Jeevika. A positive coefficient indicates that the probability of an enterprise being owned by a woman is somewhat higher with higher Jeevika intensity. Although the magnitude is not large, the direction of the effect confirms that deeper programme penetration has a positive contribution to women's entrepreneurial participation, which is in line with the evidence from SHG-based interventions in India (IFPRI, 2019 & 2020). The borderline statistical significance suggests that the effect of Jeevika is supportive but not uniform, perhaps varying by district or type of enterprise, as is often found in livelihood programme evaluations (Duflo, 2001; Banerjee & Duflo, 2011). Moreover, the positive impact of Jeevika intensity needs to be seen in the context of the large and highly significant scheme time effect, which indicates that the growth of women's entrepreneurship in Bihar is not only driven by programme exposure but also cumulative institutional learning, policy convergence and ecosystem development over time (NITI Aayog, 2022). The results indicate that higher Jeevika intensity through higher SHG coverage, access to repeat credit and advanced livelihood training can be a possible way of enhancing the participation of women in entrepreneurship. However, existing literature shows that access to finance alone is not sufficient to promote enterprise growth, unless it is coupled with access to markets, skill development and business support services (ILO, 2019; World Bank, 2022). The positive and statistically significant coefficient of increased JEEViKA intensity indicates that the probability of women's enterprise ownership is greater in the districts with higher programme penetration. The marginal effect suggests that an increase in the intensity of Jeevika by one unit raises the probability of an enterprise being women-owned by approximately 0.7 percentage points. This finding is consistent with Sen's Capability Approach which notes that development interventions enhance individuals' capabilities and freedoms by increasing access to resources, networks and opportunities. Jeevika appears to increase women's agency and involvement in entrepreneurship through self-help groups, access to credit, training and collective action.

Jeevika needs to be scaled up with market linkages, enterprise support and development pathways to scale up the impact and lift women led enterprises out of subsistence (IFC, 2025). Furthermore, research into microenterprise development has shown the importance of ongoing support systems to improve enterprise efficiency and scalability (Kruseman et al., 2020). These data point to Jeevika being more conducive to women's entrepreneurship being started, rather than being a catalyst for the success or expansion of enterprise of itself. This view is consistent with a large body of development literature that suggests the need

for livelihood programs to be embedded in a holistic framework of financial inclusion, capacity building and market-oriented reforms. Further the role of digital public platform (DPI) has also been highlighted as it plays a transformative role in improving women's access to finance, market, skills and networks (Kapoor, 2024).

Educational Level

Education emerges as an important determinant of women enterprise ownership in Bihar. Women with upper primary, higher secondary and graduate level education are less likely to own enterprises than illiterate women. The result shows that the level of education is negatively associated with the likelihood of women's ownership of enterprises. Women with upper primary, higher secondary or graduate education are much less likely to own enterprises than illiterate women. This finding is counterintuitive given the Human Capital Theory which would have predicted education to enhance productive capabilities and entrepreneurial participation. In the case of Bihar, however, educated women might have greater scope for salaried employment and hence less likelihood to be engaged in small-scale self-employment. This leads to the conclusion that women entrepreneurship in Bihar is more based on need rather than opportunity which is mostly seen in developing economies.

This result is indicative of the largely necessity-driven nature of women's entrepreneurship in developing economies (ILO, 2019). Illiterate and low educated women are often highly constrained with their access to formal wage employment and hence resort to self-employment as a coping strategy to supplement household income (Sen, 1999). In this group entrepreneurship is a response less to opportunity and more to limited alternatives in the labour market. Programmes like Jeevika have helped to lower the entry barriers for these women by providing access to microcredit, collective support through Self-Help Groups and basic livelihood training (NRLM, 2021). The literature on microfinance has shown that such interventions are especially helpful for women who are economically vulnerable to start small-scale enterprises even with low levels of formal education (Yunus, 2007; IFPRI, 2019). On the contrary, women with higher levels of education are less likely to venture into micro-entrepreneurship as indicated by the increasingly negative coefficients as education levels increase. Jeevika programme has been successful in developing entrepreneurship among educationally disadvantaged women but has been less successful in attracting educated women to enterprise ownership. This divergence suggests the need for differentiated policy approaches (Deshpande & Sharma, 2013). There is still a need for continuous support for micro-enterprises, financial inclusion and income stabilisation for the low-educated women. Policy should be focused on promoting higher value entrepreneurship among more educated women through start-up incubation, digital enterprises, skill upgrading and stronger market linkages (UN Women, 2019).

Enterprise Type

The characteristics of the enterprises also give more insights into the nature of women's entrepreneurship. Own-account enterprises (OAEs) are far more likely to be women-owned than enterprises with hired workers. The marginal effect shows that the probability of women's ownership increases by nearly 10.7 percentage points. This finding is in line with feminist theories of entrepreneurship which argue that women face structural barriers in accessing capital, markets and labour which restrict them to operate smaller enterprises with limited growth potential. This is a reflection of these constraints and not of differences in entrepreneurial ability, which is gendered. This trend is attributed to the distinct structural constraints faced by women entrepreneurs including less access to capital, low risk-bearing capacity and social norms that discourage women from taking up managerial or supervisory roles especially over male workers (UN Women, 2021). The positive association of own-account enterprises (OAEs) with women's ownership is consistent with evidence from developing economies with women's entrepreneurship concentrated in low-scale, labour-intensive activities (Pande & Ford, 2012; Hallward-Driemeier, 2013; Aterido et al., 2011). This pattern is also very much in conformity with the design of Jeevika, which attaches importance to SHG based micro-enterprises as a route to income generation. Jeevika-supported enterprises are typically small, require little fixed investment and are compatible with household responsibilities, which is important given that women carry a disproportionate burden of unpaid care work (UN, 2015). Consequently, women in Bihar have mostly entered entrepreneurship through own-account activities such as food processing, tailoring, petty manufacturing and local services. The findings also indicate serious barriers faced by women in moving from own-account enterprises to employer enterprises. These transitions typically require greater capital investments, improved market access, regulatory compliance and managerial capabilities all areas where women are likely to experience systemic disadvantages (IFC, 2019).

Location of Enterprise

The negative coefficients for enterprise operated from a fixed site or movable market locations imply that women-owned businesses are disproportionally concentrated in activities that are performed within or near the household. From a feminist perspective, this tendency is a function of the continuing influence of gender stereotypes, mobility restrictions and unpaid care responsibilities, which limit women's options in their physical and financial environments. Such constraints limit women's capacity to undertake market-oriented business activities that require greater mobility and commercial presence. This also highlights the known structural barriers for women entrepreneurs in Bihar including lack of access to commercial space, higher rental and capital requirements, and concerns about safety and mobility (World Bank, 2022; UN Women, 2024). The limited access to productive assets and physical infrastructure has been identified many times as a key constraint to the growth of women's enterprises (IFC, 2020). Enterprises that are in a fixed

location tend to have longer hours of operation, dealings with male-dominated markets and higher initial investment, all of which add up to disproportionately discourage women from starting or maintaining such enterprises (ADB, 2021). Gendered norms about mobility and participation in public space restrict women's access to work in commercial settings (UNDP, 2021). The negative effect is even higher for mobile market enterprises, which do not have a fixed location. Such activities tend to involve frequent movement from market to market or village to village, uncertain demand and a high degree of physical mobility. The coefficient is highly significant & negative which indicates that these enterprises are least likely to be women owned in Bihar. To a high degree, women's participation in such activities is constrained by social norms that restrict women's mobility, household care duties and safety risks travelling alone or carrying goods (World Bank, 2022; UN Women, 2024). Women's ability to engage in mobility-intensive enterprises is also constrained by time use considerations stemming from unpaid domestic and care work (OECD, 2021). The findings reveal that businesses owned by women in Bihar are largely home based or within the household premises, a trend consistent with the informal economies. This is also in alignment with the livelihood model led by the SHG being promoted under Jeevika that supports micro enterprises which can be taken up along with domestic responsibilities. Women tend to favour enterprise locations that reduce mobility, limit contact with the public space and allow them to combine income-earning activities with unpaid household work (Agarwal, 1994; Sen, 1999).

Manufacturing Services

Women are involved in the operation of more enterprises in manufacturing and service sectors such as food processing, tailoring, handicrafts, dairy processing, beauty services, education assistance and other home or community-based services. These activities are more accessible to women, especially those mobilised through Self-Help Groups (SHGs), as they are time efficient, can be done from home and require low fixed capital (World Bank, 2022). The significant favourable association also mirrors the Jeevika design and operational focus on women-led value-added lifestyles rather than pure trading. The result is relevant as manufacturing and services provide more value, skills and learning than subsistence trading (UNIDO 2019). These sectors raise productivity and promote incremental upgrading of enterprises (OECD, 2021). Therefore, the fact that women are concentrated in these sectors indicates a transition from survivalist entrepreneurship to more productive self-employment, even if the companies are small (Sen, 1999; Agarwal, 1994). The move is particularly important in Bihar, a state where women have limited options for non-farm employment and face institutional barriers to formal employment (Roy & Patro, 2025). The clustering of women into particular occupations across sectors also indicates ongoing gender segmentation in labour markets, which can constrain diversification into higher-growth industries (WEF, 2023).

Enterprise Group

The negative coefficients of young and older enterprises (vis-a-vis startups) also indicate that women's participation in enterprise ownership in Bihar is limited to newly established units, which again supports the post-policy expansion effect. The pattern is consistent with the literature on microenterprise dynamics which reports high exit rates and limited growth trajectories for small, informal firms (Karlan & Zinman, 2010). This finding is consistent with the Capability Approach by Sen and feminist theories which have identified enduring institutional constraints, low asset ownership, limited access to markets and unequal bargaining power as potential barriers to the long-term sustainability and growth of women-led enterprises. This finding indicates that the focus of policy should shift from enterprise entry to enterprise survival and growth. Some success has been achieved in the promotion of the startup of women, but sustained support with repeat financing, better market linkages, technology adoption and business mentoring is needed to help women-owned enterprises mature (FAO, 2018). Evidence suggests that such complementary support mechanisms are critical for improving enterprise productivity and reducing failure rates (IFPRI, 2019). Women's enterprises are likely to be short-lived and stuck at the lower end of the enterprise life cycle and unable to contribute to sustained economic growth and structural transformation without such interventions (UN, 2015). The firm's age reveals that surviving firms are more likely to be male owned, indicating that women have more constraints in scaling up and sustaining enterprises over time (Carland & Bates, 2012). This result also indicates the entry-driven nature of women's entrepreneurship in Bihar where interventions like Jeevika have been successful in bringing women into the world of entrepreneurship but less successful in maintaining their long-term continuity.

Social Group

Social group coefficients are statistically insignificant indicating that caste-based differences in women's entrepreneurship are narrowing in Bihar possibly due to inclusive SHG based mobilisation. This finding has special significance in the Bihar context in view of the long-standing caste-based inequalities in access to economic opportunities and productive assets in the state (Agarwal, 1994). Traditionally, caste has been a key determinant of occupational mobility, access to credit and non-farm ventures (ILO, 2019). The non-existence of statistically significant differences suggests that women's entrepreneurship has become comparatively inclusive across caste groups, at least at the entry level. This aligns with emerging evidence that interventions for group-based development can reduce social barriers and improve participation among historically marginalised communities (World Bank, 2012).

The findings revealed that women's entrepreneurial activity in Bihar is not only determined by the individual human capital women have, but also by the extension of capacities through collective institutions and by persistent gendered limitations inscribed

in social and economic systems. Thus, the findings provide more support to Sen's Capability Approach and feminist ideas of entrepreneurship than to the traditional expectations of Human Capital Theory. This highlights the importance of agency, social institutions and gender relations in the process of explaining women's enterprise ownership.

Table-5: Regression Results

Variable (s)	*Coefficient*	*p Value*
Dependent Variable (Log Output Value)		
Log Fixed Capital	0.7708	0.0000
Log Workers	0.1976	0.0000
Jeevika Intensity	0.0034	0.6420
Educational Level (Illiterate being benchmark category)		
Upper Primary	-0.0083	0.6840
Higher Secondary	-0.0556	0.0080
Graduate & above	-0.0759	0.0010
Enterprise Type (Hired Worker)		
Own Account Enterprise (OEA)	-0.2836	0.0000
Location of Enterprise (Without Fixed Location being benchmark category)		
With Fixed Location	0.5114	0.0000
Mobile Market without Fixed Location	0.4756	0.0000
Manufacturing Services (No being benchmark category)		
Yes	-0.0005	0.9660
Enterprise Group (Startup being benchmark category)		
Young (1-3 Years)	0.1828	0.0000
Older (More than 3 Years)	0.2447	0.0000
Social Group (ST/SC being benchmark category)		
OBC	0.0556	0.0000
General	0.0448	0.0160
Constant	7.0521	0.0000
Number of observations= 25,298 R-squared= 0.6185 Adj R-squared= 0.6183 **VIF: 1.56**		

Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).
*** and ** mean 1% and 5% level of significance.

The regression result (table-5) shows that factor inputs, scale, location, sector and experience are the major determinants of enterprise production in Bihar. Both capital and labour are positive and highly significant. Output is more sensitive to labour than capital which reflects the labor-intensive nature of small-scale enterprises. The effect of the scheme time is negative and the Jeevika intensity is found to be insignificant implying that the average output declined slightly in the post-policy period due to entry of several small enterprises with a low output. The effect of education on output is marginal, except for graduate women whose firms output slightly less. Own-account enterprises have much less output than hired-worker enterprises and fixed-location and mobile-market enterprises less. Manufacturing and service enterprises produce less, as they are concentrated in low-value segments. The enterprise age has a positive impact on output, with young and older enterprises outperforming startups. The effects are small and positive as compared to SC/ST enterprises for OBC and General households. The two models indicate a structural difference between ownership and production determinants in Bihar. Women's entrepreneurship is largely small scale, home based and driven by necessity. Policy interventions like Jeevika have facilitated participation but have limited direct impact on productivity. Enterprise output is largely a function of inputs, scale, location and experience. These findings suggest that women's entrepreneurship in Bihar is predominantly small scale, driven by necessity, and home based, and that policy interventions such as Jeevika facilitate entry but do not directly improve productivity. Enterprise growth and output are more correlated with operational than with programme intensity.

6. Efficiency of Women's Enterprise

Before using the stochastic production frontier model, Likelihood Ratio (LR) Test is employed to test used to compare two nested models and determine whether the more complex model provides a significantly better fit to the data than the simpler model.

The LR statistic is calculated as:

$$LR = -2(LL_R - LL_U)$$

where,

LL_R= Log-likelihood of the **restricted model** (OLS Model)

LL_U= Log-likelihood of the **unrestricted model** (Stochastic Production Frontier model)

Null Hypothesis (H_0):

$$\sigma_u^2 = 0$$

There is no technical inefficiency; OLS is sufficient.

Alternative Hypothesis (H_1):

$$\sigma_u^2 > 0$$

There is technical inefficiency; OLS is not sufficient.

Table-6: Likelihood Ratio (LR) Test Results

Variables	*Coefficient*	*p-value*
Log Capital	1.008	0.000
Log Worker	0.200	0.000
Constant	7.587	0.000
Variance Parameters	*Estimate*	*Std. Error*
σv	0.720	0.010
σu	0.476	0.039
σ^2	0.746	0.025
$\lambda = \sigma u/\sigma v$	0.662	0.049
$\gamma = \sigma u^2/(\sigma u^2 + \sigma v^2)$	0.304	
Number of obs = 25,391 Log likelihood = -29561.259 Prob > chi2 = 0.0000 LR Test of σu = 0 (chibar²) = 15.70		

Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).

$$\sigma_v = 0.7201$$
$$\gamma = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$$
$$\gamma = \frac{0.4765^2}{0.4765^2 + 0.7201^2}$$
$$\gamma = \frac{0.227}{0.227 + 0.519}$$
$$\gamma \approx 0.304$$

Since $\text{chibar}^2(01) = 15.70, p < 0.001$, then the null hypothesis is rejected. There is technical inefficiency in the enterprises of the State of Bihar and stochastic frontier model is better than OLS. The null hypothesis of zero technical inefficiency was rejected for Bihar by the likelihood ratio test (chibar 2(01) =15.70, p< 0.001), which implies that the stochastic frontier specification is more appropriate than a conventional OLS production function. (λ=0.662). The estimated variance ratio parameter shows that the contribution of random shocks to output variation exceeds the contribution of inefficiency effects. The associated gamma parameter (γ = 0.304) means that about 30.4 percent of the total residual variation is from technical inefficiency, while the remaining 69.6 percent is from statistical noise and other random factors (Table-6). The inefficiency is statistically significant but is relatively much smaller than that found in the pooled sample, suggesting that differences in enterprise performance within the state are driven more by exogenous and stochastic factors than by differences in managerial efficiency.

Likelihood Ratio (LR) Test Results confirmed that OLS is not suitable compared to stochastic production frontier model (SPF) for measuring enterprises efficiency in Bihar. The SPF can be written as:

$$\ln(Y_i) = \beta_0 + \beta_1 \ln(Li) + \beta_2 \ln(Ki) + vi - ui$$

where,

Y_i= output of enterprise i
L_i= labor input
K_i= capital input
v_i= random statistical noise
$u_i \geq 0$= technical inefficiency
Var(ui) = f (Jeevika Intensity)

Table-7: Stochastic Production Frontier Model Results

Variable (s)	*Coefficient*	*p Value*
Dependent Variable (Log Output Value)		
Log Fixed Capital	1.0067	0.000***
Log Workers	0.2042	0.000***
lnsig2v	-0.6906	0.000***
lnsig2u		
Jeevika Intensity	-0.5743	0.000***
Constant	0.4037	0.008**
Number of observations= 25,391 Prob > chi2= 0.000 sigma_v= 0.7079 Log Likelihood = -29,440 Wald χ^2 (2) = 24,274.44 Technical Efficiency= 0.7118		

Source: Author's Estimation using the Annual Survey of Unincorporated Sector Enterprises (ASUSE, 2023-24).
*** and ** mean 1% and 5% level of significance.

$$LR = -2(LL_R - LL_U)$$

From table-8, LR=−2(−29561.259+29440.651)
LR=241.216

This LR statistic with 1 degree of freedom is highly significant ($p < 0.001$) showing that the intensity of Jeevika is a significant predictor of variations in technical inefficiency. The stochastic frontier analysis (SFA) estimates the production technology of the enterprises in Bihar with explicit consideration of technical inefficiency. Unlike conventional regression models, this approach decomposes deviations from the maximum feasible output into random noise and inefficiency which provides a more precise assessment of enterprise

productivity and the role of policy interventions such as Jeevika (Aigner, 1977; Coelli et al. 2005). SFA has been widely used in the efficiency analysis of small-scale and informal enterprises. The estimated production function suggests that fixed capital is the most important determinant of enterprise output in Bihar. The estimated coefficient on log fixed capital is approximately one and statistically significant. So, other things being equal, a one percent increase in capital increases output by nearly one percent. This finding is in line with the production theory that stresses the importance of capital as a major source of productivity, especially in capital-constrained environments (Solow, 1957; Jorgenson, 1963). The result indicates the acute capital constraints faced by enterprises in Bihar especially informal and micro-enterprise segments. The enterprises have limited access to formal credit and weak asset ownership which constrain capital accumulation. Enterprises depend on small scale financing. That is, a small increase in capital investment produces large increases in productivity. This is especially true in the case of SHG based programmes like Jeevika which aims at improving credit access and asset creation amongst women led enterprises. Output also has a positive impact from Labour input but the effect is small in comparison. The coefficient on log workers suggests that a 1 percent increase in labour causes only about a 0.20 percent increase in output. The low elasticity of labour is relatively low because the marginal returns to labour are falling which is a phenomenon in many economies with a large labour supply (Lewis, 1954; Schultz, 1964). The overall results show a consistent pattern. Jeevika's success in promoting women's entrepreneurship and technical efficiency has limited impact on output in the short run because of the prevalence of small-scale, own-account enterprises in low-value activities.

The mean technical efficiency score of women-led enterprises in Bihar is 0.712 meaning the women-led enterprises are estimated to be operating at approximately 71.2 per cent of their potential production frontier given their existing levels of labour and capital (table-7). In other words, these enterprises are not using the available resources and managerial capability to the full extent. The remaining 28.8 per cent is the potential for improvement in output that can be achieved through better management practices, better production processes, better skills, adoption of technology and better allocation of resources without having to put in more inputs. This suggests that productivity gains may be achieved not only through increasing investment, but also through interventions to improve the efficiency of enterprises. Such large efficiency gaps underscore the importance of programmes like Jeevika that can build entrepreneurial capabilities and help enterprises move closer to the production frontier. Policy-wise, it may be more cost effective to improve enterprise performance by reducing inefficiency rather than simply increasing capital or labour inputs.

7. Conclusion

The study highlights a remarkable change in Bihar's economic landscape. The slow movement of female workers away from agriculture sector and significant rise of women-

owned enterprises over the past decade indicates towards a structural transformation in the state. The FLPR is still below the national average, but it has increased significantly post 2018. The share of female proprietary enterprises increased more than fourfold between 2015–16 and 2023–24, substantially raising Bihar's contribution to women's entrepreneurship at the national level. This shift reflects broader socio-economic changes, including improvements in women's access to education, financial services, and livelihood opportunities, supported by sustained economic growth and targeted policy interventions.

The empirical results from OLS and Stochastic Production Frontier together imply that there is no strong direct effect of Jeevika intensity on output, but it significantly reduces technical inefficiency. This suggests that the programme has been effective in improving the way in which enterprises use available inputs, even if production levels have not yet been substantially increased. This highlights the importance of productivity-oriented interventions such as skill upgrading, quality enhancement and technology adoption from a policy perspective. Training modules under Jeevika should therefore go beyond basic entrepreneurial skills to include sector-specific technical training, process upgrading and quality certification. Policy interventions should aim at collective market access solutions such as shared workspaces, common facility centres and women-only market zones that can reduce individual costs while enhancing visibility and customer reach. The Stochastic Production Frontier results show a key policy tradeoff. Higher Jeevika intensity helps in reducing inefficiency at enterprise level but the post policy period has shown higher average inefficiency due to rapid entry of new small-scale enterprises. This composition effect is required for inclusion-focused interventions. Performance-based incentives, follow-up support and mentoring can help new firms, as they age, move closer to the production frontier. Efficiency improvements are a process that unfolds over time, not something that happens instantly.

Overall, the results suggest that Jeevika has built a strong foundation for women's entrepreneurship in Bihar through participation promotion and efficiency enhancement. But sustained gains in output and income will require a broader enterprise development strategy integrating credit, skills, infrastructure and market access. Future policy frameworks should thus see Jeevika not just as a programme of livelihood and inclusion but also as an enterprise development platform enhancing productivity. Such a transition can only help women's entrepreneurship make a meaningful contribution to structural transformation, employment generation and inclusive growth in Bihar.

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