Innovations

Female Labor Force Dynamics in Tanzania: A Generalized Linear Model Analysis of Employment Factors among Women Aged 15+

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Abstract: *This study examined the determinants of female labour force participation in Tanzania, focusing on socio-economic and demographical factors, particularly for women aged 15 and above. The labour force participation provides substantial benefits in Tanzania, contributing not only to economic development but also to cultural norms and social equity. Despite a number of studies done in specific locations within Tanzania, this study addresses the gap of specific locations by utilising a nationally representative dataset across the entire country to examine the key determinants. The study uses a cross-sectional dataset (Integrated Labour Force Survey dataset 2020/2021). The binomial probit generalised linear model was applied to examine the determinants. The study findings reveal that rural women, married women, and cohabiting women are more likely to participate in the workforce compared to urban and single women, respectively. Age of woman, income level, and family size are positively related to labour force participation. Health insurance and certain education levels demonstrate mixed or negative associations. This study reveals the need for targeted policies promoting equitable access to formal employment, addressing socio-cultural barriers, and aligning educational programs with labour market demands. The study's insights contribute to the broader discourse on enhancing gender equity in labour markets in Tanzania and sub-Saharan Africa at large.*

Keywords: *Female labor force dynamics, Employment factors, Generalized Linear Model, Women aged 15+*

1.0 Introduction

The participation of women in the workforce remains a critical issue that continues to attract both scholarly and policy-oriented discussions, particularly in the context of Tanzania and sub-Saharan Africa. Gender disparities in labor force participation are not just economic challenges but social and cultural ones as well (World Economic Forum, 2023; UN Women, 2023). Recent studies emphasize the need for understanding how such disparities impact broader economic growth, social equity, and sustainable development (World Bank, 2021a; Thaddeus et al., 2022). The implications are far-reaching, influencing policy decisions and shaping the paths toward achieving the 2030 United Nations Agenda's goals of economic growth, social inclusion, and environmental sustainability (United Nations, 2015a). While research has long highlighted the outcomes of women's participation in the workforce, there remains a significant gap in understanding how various socio-economic factors uniquely influence their participation rates in Tanzania. It is surprising that despite the extensive focus on global labor dynamics, less attention has been paid to the intersection of gender, economic status, and regional disparities within Tanzania nation with diverse economic activities, from agriculture to emerging service sectors (UNCTAD, 2018; International Labour Organization, 2018). For example, while existing literature examines global gender disparities, the particular challenges women face in transitioning from informal to formal sectors in Tanzania, especially post-pandemic, remain underexplored (World Bank, 2022; Thaddeus et al., 2022).

The current discourse is inconclusive regarding the factors that contribute to or inhibit women's active participation in Tanzania's labor market. Previous studies have predominantly focused on advanced economies (Cantwell & Mudambi, 2005; Dunning & Narula, 1995), while research on labor force dynamics in emerging markets, including Tanzania, remains limited. The lack of a focused analysis on gender disparities in Tanzania's labor force highlights a critical gap. Moreover, studies have yet to comprehensively address how factors such as socio-economic status, regional disparities, and policy environments affect women's opportunities and choices in Tanzania's diverse economic landscape (ILFS, 2021).

This study aims to address the theoretical gap by analyzing the interplay between economic status, gender, and regional disparities within the Tanzanian workforce. It will specifically focus on how these factors influence the transition of women from informal to formal sectors, using data from ILFS (2021). By examining these dynamics, the study seeks to provide a deeper understanding of the mechanisms behind gender disparities in Tanzania's labor market. This theoretical approach directly addresses the identified gap, proposing a model that considers both the economic and socio-cultural dimensions influencing women's workforce participation.

2.1 Theoretical Review

2.1.1 Human Capital Theory

widely attributed to Gary Becker, suggests that investments in education, skills, and training enhance an individual's productivity and thus increase their labor market participation. Becker's foundational work in the 1960s laid the groundwork for this theory, arguing that education yields economic returns by improving job prospects and earnings potential. This theory implies that women with higher educational attainment in Tanzania are more likely to participate in the formal employment sectors (Mulema, 2023; Abramsky et al., 2019). Becker's perspective continues to influence studies on workforce dynamics, particularly in the context of gender and labor economics.

2.1.2 Gender Norm Theory

There is no single inventor of Gender Norm Theory, has roots in feminist and sociological research that emerged in the mid-20th century. Researchers like Simone de Beauvoir and, more recently, scholars in sociology and gender studies have explored how socially constructed roles and expectations impact women's employment. These norms can create systemic barriers to women's labor force participation, as seen in Tanzanian society, where traditional expectations often prioritize women's roles in the domestic sphere over formal employment (Vyas & Heise, 2014). Understanding these norms is crucial in developing policies to improve gender equity in the workforce (Hémono et al., 2023).

2.2 Literature Review

The dynamics of female labor force participation in Tanzania are shaped by an intricate combination of socio-economic factors, entrenched gender norms, and a predominantly informal employment landscape. Recent studies emphasize that labor market inequalities not only impact economic growth but also reflect broader social and cultural challenges in sub-Saharan Africa (World Economic Forum, 2023; UN Women, 2023). The significance of understanding these dynamics is underscored by global goals, including the 2030 Agenda, which emphasizes economic growth, social inclusion, and environmental sustainability as essential for achieving equitable labor markets (United Nations, 2015a).

One of the primary challenges facing women in Tanzania is the nature of the informal sector, which dominates female employment. According to Fischer (2013), while female labor force participation has risen, many women find themselves in low-wage sectors with poor working conditions, such as hospitality. This sectoral pattern aligns with Diao et al. (2016), who note that much of Tanzania's employment growth has been in the informal sector, which typically lacks job security and benefits. Myumbo (2021) adds that these conditions are particularly pronounced for rural women, who often face precarious employment with limited financial stability or advancement opportunities. This reliance on informal employment has implications for long-term socio-economic mobility and

underscores the need for policies that support formal employment opportunities for women.

Socio-demographic factors also play a significant role in shaping employment outcomes for Tanzanian women. Mulema (2023) identifies age, gender, educational attainment, and residence as key determinants of the types of employment women engage in. These factors intersect with gender norms, creating complex outcomes. Vyas and Heise (2014) emphasize that increased earnings for women can sometimes disrupt traditional household dynamics, occasionally leading to intimate partner violence (IPV). This finding highlights the potential tensions between economic empowerment and household stability, an issue further explored by Hémono et al. (2023), who show that while cash transfers can improve women's household status, the effectiveness of these interventions is often contingent on pre-existing gender norms.

Education is another crucial factor, with studies demonstrating that higher educational attainment correlates with improved employment opportunities and reduced vulnerability to IPV (Abramsky et al., 2019). However, many women, particularly in rural areas, face substantial barriers to accessing quality education and skill development opportunities (Myumbo, 2021; Iftikhar et al., 2017). This lack of access perpetuates cycles of informal employment and economic dependency, reinforcing gender disparities in the labor market.

Programs aimed at economic empowerment, such as cash transfers, have also been examined for their impact on women's workforce participation and vulnerability to IPV. Hémono et al. (2023) indicate that cash transfers can potentially enhance women's status within households and lower IPV risks, but the outcomes depend heavily on household dynamics and prevailing gender norms (Vyas & Heise, 2014). The complexity of these programs suggests that effective interventions must go beyond financial support to address the underlying socio-cultural barriers women face in achieving economic independence.

The current literature underscores a critical gap in understanding how these socio-economic, demographic, and regional disparities uniquely influence female labor force participation in Tanzania, especially in transitioning from informal to formal employment. Addressing these complexities requires a nuanced approach that includes both economic and socio-cultural dimensions to effectively empower women in the workforce and reduce the barriers to equitable participation.

Theoretical Framework

This study used random utility model; the model demonstrates the women decision towards participation in labour force. The individual participates in labour if the utility derived from participation (U_i^W) in working exceeds the utility of not working U_i^N. Where i represent the utility of individual (i) when participate in labour force or not. The Random utility model as modelled as follows:

$$U_{Wi} = V_{Wi} + \pi_{Wi} \tag{1}$$
$$U_{Ni} = V_{Ni} + U_{Ni} \tag{2}$$

Where; V_{Wi} and V_{Ni} are observable demographic and socioeconomic factors such as education level, marital status, household income, occupation, age household size and location type and π_{Wi} and π_{Ni} are disturbance term of working or not, respectively. The women participate in labour force if π_{Wi} and π_{Ni}. This displays $V_{Wi} - V_{Ni} > \pi_i$ and $U_i = V_{Wi} - V_{Ni}$(3) is the derived utility for women participating in labour force. Hence, we model the probability of participation as: -

$$P(LFP_i = 1) = P(Z_i$$
$$> \pi_i) \tag{4}$$

And assuming the π_i follow a specific distribution.

2. Methods

2.1 Research Design

The study employs a cross-sectional survey design, utilizing data from the 2020/21 Integrated Labor Force Survey (ILFS) conducted by the National Bureau of Statistics (NBS) in collaboration with the Office of the Chief Government Statistician (OCGS) of Zanzibar. The ILFS aims to gather comprehensive labor market information (LMI) across the United Republic of Tanzania, focusing on socio-economic characteristics, employment status, and labor force dynamics. This survey design allows for the analysis of factors influencing women's workforce participation in Tanzania.

2.2 Data Collection

The ILFS data was collected using structured questionnaires, covering a variety of labor market indicators such as employment, unemployment, labor force participation, and socio-economic attributes of respondents. Data collection was conducted from July 2020 to June 2021 using Computer Assisted Personal Interviewing (CAPI) systems, ensuring accuracy and efficiency in data capture. Data collection instruments were designed based on international standards set by the internationallabor Organization (ILO) to ensure comparability and reliability of labor statistics.

2.3 Sampling Design

The ILFS employed a two-stage stratified sampling technique to ensure representativeness across different regions of Tanzania, including both Tanzania Mainland and Zanzibar. In the first stage, Enumeration Areas (EAs) were selected using Probability Proportional to Size (PPS) methodology, ensuring that regions with larger populations had a higher chance of selection. The second stage involved selecting households from each EA using systematic random sampling. This approach ensured that the survey captured a diverse set of socio-economic conditions across urban and rural areas.

The survey covered a total of 26,611,745 individuals, representing the economically active population. For this study, the focus is on women aged 15 years and above, who represent a significant portion of the labor force. The sampling design enables robust analysis of labor market trends and gender disparities in workforce participation.

2.4 Data Processing

Data collected from the survey was processed using Census and Survey Processing System (CS Pro) software for data entry and initial cleaning. Further analysis was conducted using Statistical Packages for Social Sciences (SPSS) for descriptive statistics and Stata for more advanced inferential analyses, including regression models to determine factors influencing women's labor force participation.

2.5 Weighting Procedure

To ensure the survey results are representative of the national population, sampling weights were applied during the analysis. These weights adjusted for differences in selection probabilities and non-response rates among the sampled households. The use of weights ensures that the findings reflect the true characteristics of the entire population of Tanzania, including both urban and rural areas. The weight was expressed more simply as follows using the probability's prior expression:

$$W_{hi} = \frac{M_h \times M'_{hi}}{n_h \times M_{hi} \times m_{hi}} \qquad (5)$$

Where by:

$W_{hi} =$ basic weight for the sample households in stratum h of the i-th sample EA

The difference between the number of households listed in each sample EA and the equivalent number from the sampling frame determines the weights for each stratum.

2.6 Ethical Considerations

The 2020/21 ILFS adhered to ethical standards of data collection, including obtaining informed consent from all respondents and ensuring data confidentiality. This study uses secondary data from the ILFS, and ethical approval for the analysis was obtained from the National Bureau of Statistics (NBS) as part of the data use agreement.

2.7 Model Specification

In this study, the dependent variable is binary: the decision of a woman to participate in the labour force or not. "1" for participating and "0" otherwise. The model was specified as: -

$$P(Y = 1|X) = \Phi(X^T\beta) \qquad (6)$$

Where; $Y \in \{0,1\}$ Binary outcome, X is vector of independent variables, β is the vector of coefficients, and $\Phi(\cdot)$ is the CDF of standard normal distribution.

3. Results

3.1 Surveyed Respondent's Sex Information

The demographic data collected during the survey revealed a fairly balanced distribution of respondents by sex, with a total of 51,751 individuals participating. Among these respondents, 24,872 were male, representing 48.06% of the total sample, while 26,879 were female, accounting for 51.94%. The cumulative percentage for female respondents reached 100%, indicating that all participants have been accounted for. This slight predominance of female participants may provide valuable insights into the gender dynamics within the surveyed population.

Table 4.1 Surveyed Respondent's Sex

Sex	Freq.	Percent	Cum.
Male	24872	48.06	48.06
Female	26879	51.94	100.00
Total	51751	100.00	
Source: Computational on 2020/2021 Integrated Labor Force Survey			

3.2 Disparities in Employment Status by Sex

Table 3.2 reveals significant disparities in employment status between males and females among the total of 43,553 respondents. Males have the highest employment figures, with 12,079 employed, while females have 11,545 employed, reflecting a slight difference. However, the unemployment rate is notably higher for females, with 2,011 unemployed compared to 862 males, indicating that females face greater challenges in securing jobs. Additionally, 9,197 females are classified as inactive, compared to 7,859 males, further highlighting the disparities. The Pearson Chi-squared statistic of 489.96 and a p-value of 0.0000 confirm that these differences are statistically significant, underscoring the need for targeted interventions to address gender disparities in the labor market.

Table 3.2 Detection of Disparities of Employment Status Across Sex

Sex	National Employment Definition			
	Employed	**Unemployed**	**Inactive**	**Total**
Male	12079	862	7859	20800
Female	11545	2011	9197	22753
Total	23624	2873	17056	43553
Pearson Chi2 = 489.96 Prob = 0.0000				

Source: Computational on 2020/2021 Integrated Labor Force Survey

3.3 Distribution of Women Aged Above 15 used as Unit of Analysis

The frequency distribution in Figure 3.2 from the 2020/2021 Integrated Labor Force Survey shows that the majority of women surveyed are in the prime working age group (25-54), which totals 8,646 people. In comparison, the smallest age group are those approaching retirement with age ranges from 55 to 64 years, with a frequency of 1,128. This distribution emphasizes the demographic concentration within mid-life ages, with a gradually decreasing proportion in the older age category.
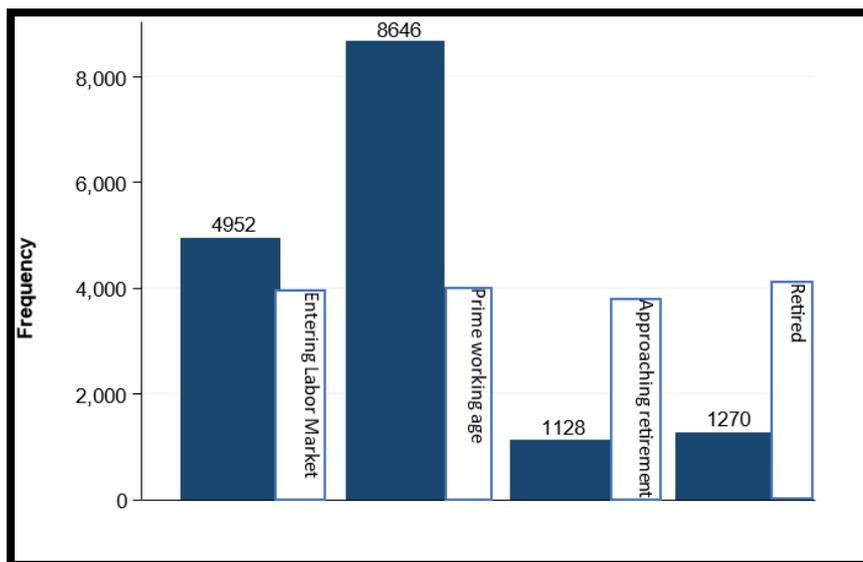

Figure 3.2: Bar Chart to represent Women Aged Above 15
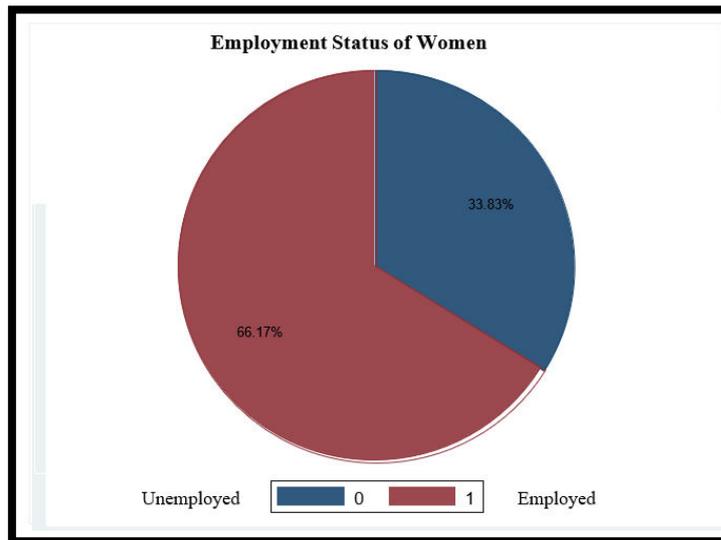**Source:** Computational on 2020/2021 Integrated Labor Force Survey

Figure 3.3: Pie Chart to represent Employment Status of Women
Source: Computational on 2020/2021 Integrated Labor Force Survey

The analysis of employment status among women shown in Figure 3.3, based on the 2020/2021 Integrated Labor Force Survey, reveals that 66.17% are employed, while 33.83% remain unemployed. This high unemployment rate suggests significant barriers for women in accessing employment opportunities, underscoring the need for targeted policies to support job creation, skill development, and workforce inclusion. These findings highlight critical areas for intervention to enhance female labor force participation and promote gender equity in the labor market.

3.4 Assumption Diagnosis for Better Inference

The histogram in Figure 3.4 offers a visual assessment of the data distribution. The bars do not form a bell-shaped curve and instead display left skewness, indicating asymmetry. This suggests that the data does not approximate a normal distribution, thereby violating the assumption of normality.

Due to non-normal data distribution, a Generalized Linear Model (GLM) with a binomial family and probit link function is applied. This approach is suitable for binary outcomes and does not assume normality, ensuring reliable results.
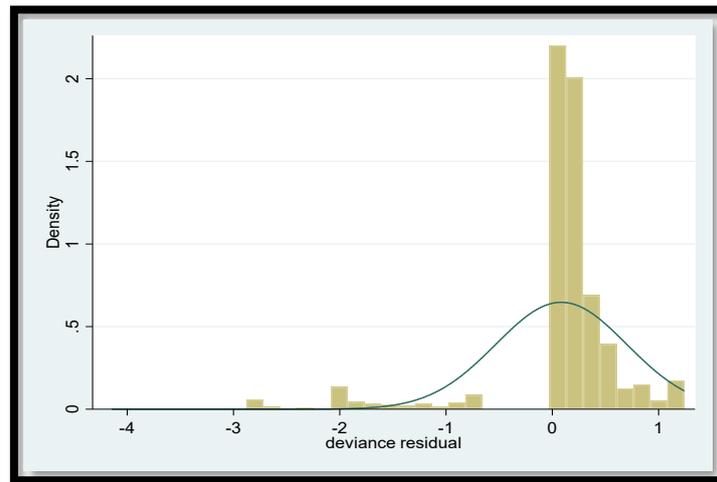
Figure 3.4: Histogram of Residuals to test the normality assumption
Source: Computational on 2020/2021 Integrated Labor Force Survey

3.5 Binomial Probit Generalized Linear Model

In Table 3.3 the Binomial Probit Generalized Linear Model (GLM) results provide a statistically significant look into factors affecting Tanzanian women's likelihood of employment, with a chi-square value of 584.166 (p < 0.001) and an Akaike Information Criterion (AIC) of 4153.077, the model is well-suited to examine the dynamics of female labor force participation. This model, based on a sample of 4,415 observations, identifies significant predictors such as location, marital status, age, income, household size, health insurance, and education level, showing a complex interplay of socio-economic factors impacting women's employment outcomes.

Location plays a significant role in employment likelihood. Women residing in rural areas are more likely to be employed than those in urban areas, with a positive coefficient of 0.185, statistically significant at the 1% level. This finding could suggest that rural settings offer different employment opportunities or socio-economic conditions that influence women's labor participation differently than in urban centers.

Marital status emerges as another crucial factor. Compared to single women, married, cohabiting, and widowed women are significantly less likely to be employed, with negative coefficients of -0.413, -0.512, and -0.663, respectively, all significant at the 1% level. This trend may reflect social or economic roles tied to marital status, potentially impacting women's ability or need to participate in the labor market. Conversely, divorced and separated women do not show significant differences in employment likelihood compared to single women, suggesting that employment status for these groups may be less influenced by marital roles.

The age group also affects employment outcomes. Women aged 36-64 are more likely to be employed than those aged 15-35, with a positive and significant coefficient of 0.293, possibly due to accumulated work experience or greater stability in employment at mid-life. However, women aged 65 and older are

significantly less likely to be employed, as indicated by a negative coefficient of -0.51, suggesting potential retirement, health issues, or societal norms influencing labor force exit at older ages.

Income and household size are positively associated with employment. Gross income shows a highly significant yet small positive association, while larger household sizes also correlate with a slightly higher likelihood of employment (coefficient of 0.015, p < .05). This association might indicate that financial or caregiving responsibilities within larger households motivate women's participation in the labor force.

The presence of health insurance is negatively associated with employment (coefficient of -0.109, p < .01), suggesting that insured women may belong to socio-economic groups with distinct employment challenges or could face health-related barriers affecting employment opportunities. This outcome may reflect the complexity of economic factors tied to health coverage.

Educational attainment presents mixed effects on employment. Compared to women with no formal education, those with primary or secondary education are less likely to be employed, with coefficients of -0.259 and -0.558, respectively, both significant at the 1% level. Vocational and tertiary education levels also have a marginally negative association with employment. However, university-level education shows no significant impact, indicating potential job market constraints for women with higher education. These trends underscore possible mismatches between educational qualifications and employment opportunities accessible to women.

Table 3.3: Generalized linear models

Employment	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Location (Ref: Urban)							
Rural	.185	.056	3.32	.001	.076	.295	***
Marital status (Ref: Single)							
Married	-.413	.06	-6.93	0	-.53	-.296	***
Cohabit	-.512	.099	-5.15	0	-.706	-.317	***
Widowed	-.663	.109	-6.09	0	-.876	-.45	***
Divorced	.029	.12	0.25	.806	-.205	.264	
Seperate	.206	.176	1.17	.243	-.14	.551	
Age Group Level (Ref: 15-35)							
36-64	.293	.058	5.10	0	.181	.406	***

65+	-.51	.108	-4.73	0	-.721	-.298	***
Gross Income	0	0	18.61	0	0	0	***
Household Size	.015	.007	2.22	.027	.002	.029	**
Health Insurance	-.109	.02	-5.54	0	-.148	-.07	***
Education Level							
Primary	-.259	.081	-3.22	.001	-.417	-.101	***
Secondary	-.558	.095	-5.88	0	-.744	-.372	***
Vocation	-.282	.145	-1.94	.052	-.566	.002	*
Tertiary	-.273	.154	-1.77	.076	-.574	.028	*
Universi	-.106	.14	-0.76	.447	-.38	.168	
Constant	.755	.153	4.95	0	.456	1.054	***

Mean dependent var	0.630	SD dependent var	0.483
Number of obs	4415	Chi-square	584.166
Prob > chi2	0.000	Akaike crit. (AIC)	4153.077
*** p<.01, ** p<.05, * p<.1			

4.1 Discussion

This study examines factors influencing Tanzanian women's labor participation, with key influences including location, marital status, age, income, household size, health insurance, and education. Rural women are more likely to be employed than urban women, often in informal jobs, differing from past studies suggesting urban areas offer more opportunities (Myumbo, 2021). Marital status plays an important role, as married women are less likely to work than single women, aligning with Gender Norm Theory, which emphasizes cultural expectations around domestic roles (Vyas & Heise, 2014). Age is also crucial, with women aged 36-64 more likely to work, likely due to experience, while older women face health and retirement pressures. Household size and income positively affect employment, suggesting that financial needs drive women to work (Mulema, 2023).

Interestingly, health insurance shows a negative link to employment, perhaps indicating that health-related barriers affect work opportunities. Education also shows mixed results; women with primary and secondary education have lower employment rates, challenging Human Capital Theory, which typically links education with job access (Becker, 1964). These findings reveal a gap between educational levels and job opportunities, as seen in informal sectors that do not

always value formal credentials (Myumbo, 2021). Addressing these issues calls for tailored policies, as flexible work options, skill programs, and health support could improve women's workforce access. Additionally, aligning education with market demands is essential for meaningful change.

4.2 Conclusion

This study highlights the socio-economic and demographic factors influencing female labour force participation in Tanzania. Key determinants include location, marital status, age, income, household size, health insurance, and education. Rural women and those aged 36–64, more likely to participate in the workforce, while marital status and educational mismatches pose barriers to employment. These findings underscore the need for targeted policies addressing socio-cultural norms, aligning education with labour market demands, and enhancing support for women's employment. By fostering gender equity, such interventions can drive inclusive economic growth and sustainable development in Tanzania.

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