Empowering Women Through Electricity: Effects of Rural Electrification on Female Employment in Bangladesh

Presented by
Afrin Mahbub
Programme Associate
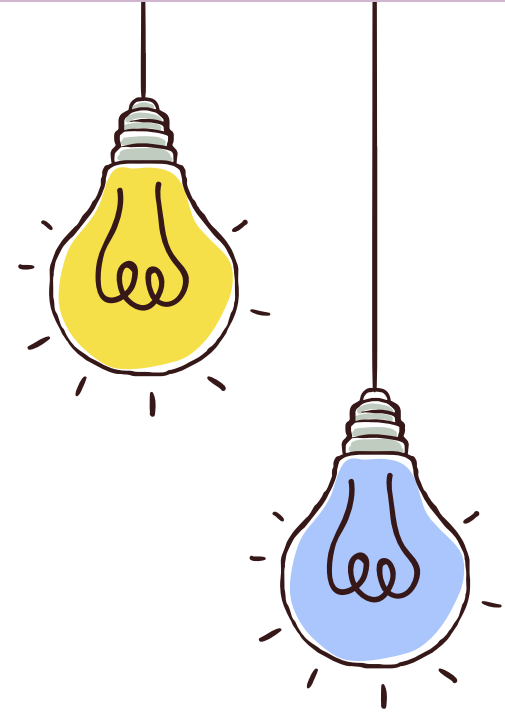Centre for Policy Dialogue (CPD)
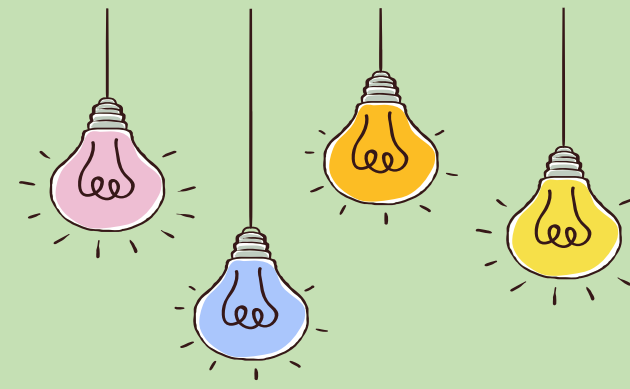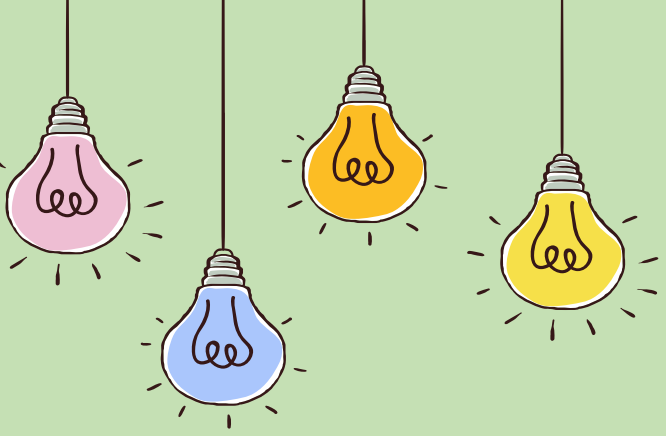
Presented at
Young Scholars Seminar Series (YSSS)
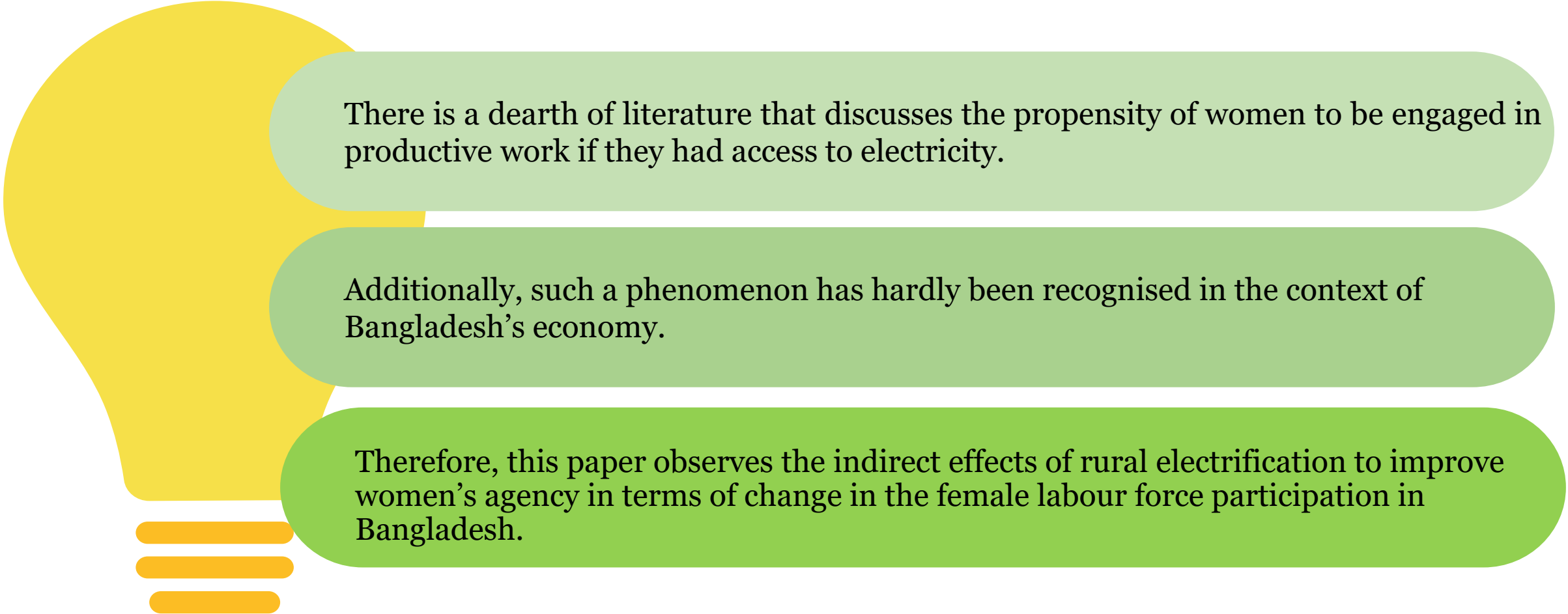
Date: 8 September 2022

Outline

1. Introduction

1.1 Introduction

- Women's empowerment has been an integral issue that is widely assessed and promoted worldwide.

- Due to the differences between women and men which is more evident in rural areas in Bangladesh, the female cohort becomes victims of gender-based discrimination, loss of social welfare and basic human rights.

- Thus it is important to empower women with greater bargaining power allowing them to make decisions and improve their agency.

- Agency plays an integral part in the social welfare of women as it measures the extent to which women have the freedom to make independent critical choices without the influence of any other dominant individual.

- Electricity usage is implicated in everyday life while having a significant impact in profound ways that often go unnoticed.

- Lack of access to electricity impedes women's economic productivity as they are limited within the hours of daylight when they prioritise their household responsibilities more over other economic choices.

- A loss in economic productivity may reduce women's agency.

1.2 Research Question

There is a dearth of literature that discusses the propensity of women to be engaged in productive work if they had access to electricity.

Additionally, such a phenomenon has hardly been recognised in the context of Bangladesh's economy.

Therefore, this paper observes the indirect effects of rural electrification to improve women's agency in terms of change in the female labour force participation in Bangladesh.
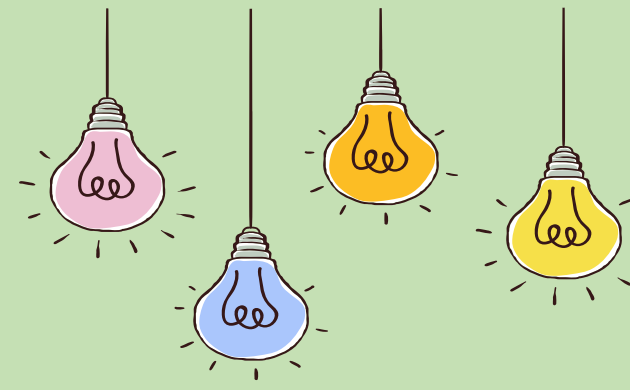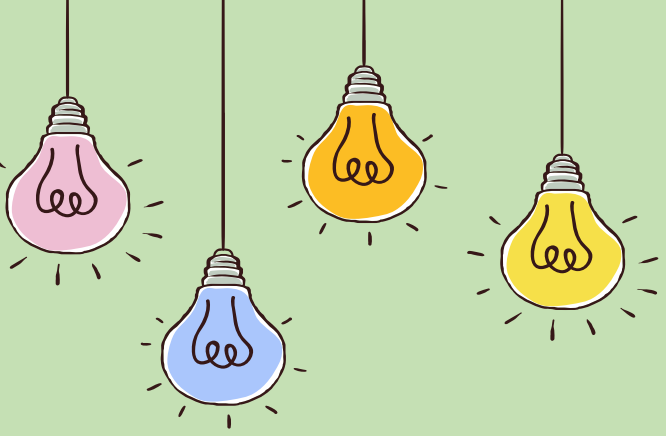
2. Literature Review

2.1 Literature Review

- A study conducted by Grogan and Sadanand (2013) revealed that having access to electricity in rural areas of Nicaragua, increased the likelihood of women being employed in the labour market to about **23%.**

- In another study, Dinkelman (2011) revealed that the provision of electricity in rural South Africa helped to increase women's employment by **9%** over a period of five years.

- A historical study on the US revealed that having access to modern technologies as a child accounted for a **25%** increase in women's employment observing a postponed effect of providing access to electricity (Lewis, 2015).

- Annecke (2005) and Matinga (2010) observed that in South Africa, access to electricity allowed women to increase their income by either establishing their own shop or operating another shop.

- Women in Mali have also reported to have increased their income by **$44 per year** by using electrical appliances for income generating activities such as rice hulling and Shea nut grinding (Sovscool et al, 2013).

2.2 Theoretical Explanation

- Electricity increases productivity at home enabling women to participate in the labour market.

- Electricity enables the provision of artificial light which allows women the freedom to be more productive economically reducing the time spent on unpaid labour.

- Having access to light due to electricity offers women with greater mobility during the day allowing them to venture out for productive work while leaving household chores for the evening.

- Electricity allows increased usage of information technology, television, radio, and mobile devices establishing a channel to access information which may widen the limitations for women providing them with economic opportunities.

- Access to electricity in rural areas will facilitate internet connectivity allowing opportunities to improve their digital literacy.

- Young girls exposed to electronic devices and a wider network of information will have a higher propensity to be economically active in the long run.

- Education for girls will also improve which may have long-term implications for women having a greater participation rate in the labour force insinuating an indirect effect of electrification on female employment.

- Electrification may also lead to better health outcomes for women since healthy women have a greater proclivity to participate in the society and market in an attempt to improve their own agency.
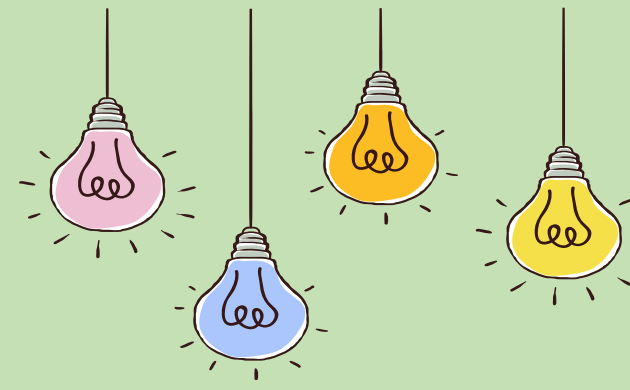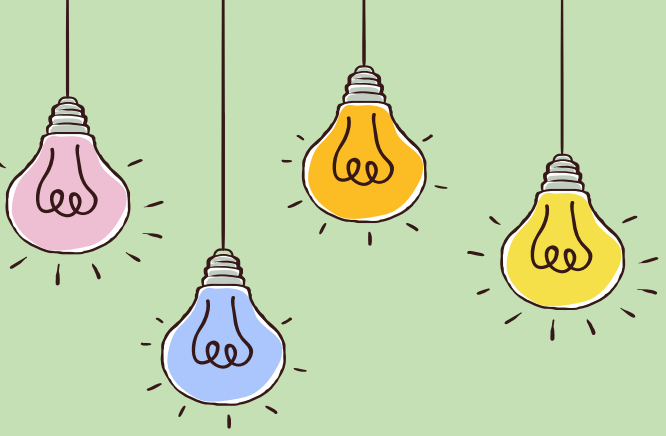
3. Methodology and Data

3. Methodology and Data

- The paper took an empirical approach to assess the significance of access to electricity in rural on female labour force participation.

- The study conducted a unit root test to account for stationarity followed by a Johansen Cointegration test to check for any existing long-run association between variables.

- Afterwards, this paper conducts a bivariate regression analysis using the OLS method with variables at their first difference followed by a VAR analysis to observe any short-run dynamics between the two variables.

- The data for the variables which include the percentage of female labour force participation and the percentage of rural areas having access to electricity, were taken from the World Development Indicator from 1994 to 2019.

3.1 Bivariate Regression using OLS

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \Delta \varepsilon_t$$

- Here,
- ΔY = Change in labour force participation rate, female (in percentage)
- ΔX = Change in access to electricity in rural areas (in percentage)

3.2 Vector Autoregression

- A VAR model also accommodates the analysis which observes the short run causality, if any, among the variables

- In a VAR model each time series is modeled as a function of its lag variables or past series.

$$Y_t = \alpha + \beta_1 Y_{t-1} + \gamma_1 X_{t-1} + \beta_2 Y_{t-2} + \gamma_2 X_{t-2} + \varepsilon_{1,t}$$

$$X_t = \mu + \beta_1 Y_{t-1} + \gamma_1 X_{t-1} + \beta_2 Y_{t-2} + \gamma_2 X_{t-2} + \varepsilon_{2,t}$$

- Here,
- α, μ = intercepts
- $\beta_1, \beta_2, \gamma_1, \gamma_2$ = short-run dynamic co-efficient
- $\varepsilon_{1,t}, \varepsilon_{2,t}$ = residuals
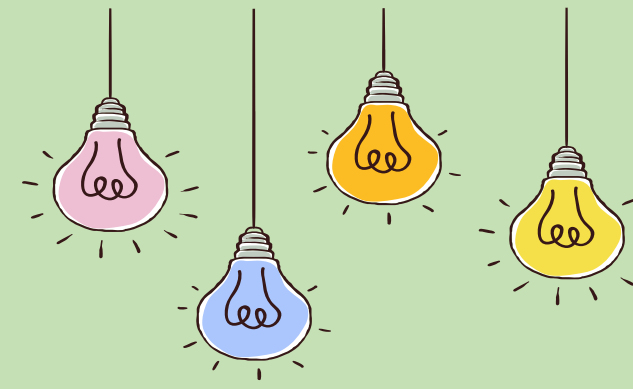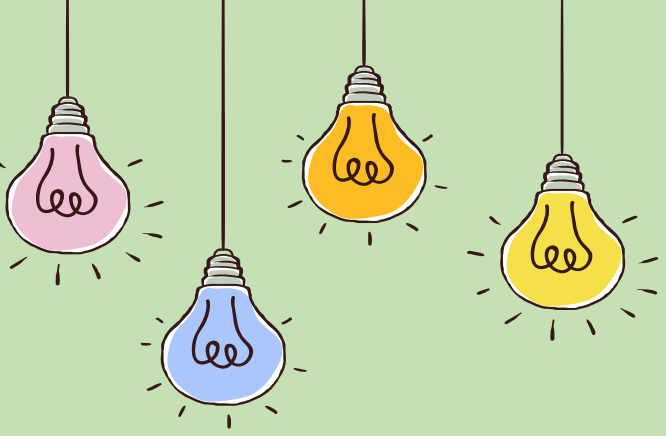
4. Findings of the Study

4.1 Unit Root Test

Variable Name	Test Statistics	Critical Value at 5%	Stationarity
Female labour force participation (level)	1.839	-3.000	**Non-stationary**
Access to electricity in rural area (level)	0.484	-3.000	**Non-stationary**
Female labour force participation (first difference)	-4.421	-3.000	**Stationary**
Access to electricity in rural area (first difference)	-6.354	-3.000	**Stationary**

- Since the value of the test statistics is greater than the critical value for both variables at first difference, it can be concluded that the variables are non-stationary at level but stationary at first difference.
- Therefore, a cointegration test was conducted to observe any long-run association between the variables.

4.2 Cointegration Test

Maximum Rank	Trace Statistics	5% Critical Value
0	**10.4**	15.4
1	3.2	3.76

- Since the trace statistics for zero cointegration is less than the critical value at 5%, the null hypothesis cannot be rejected which implies that there is, in fact, no cointegration among the variables.

- Therefore, it can be concluded that there is no long-run association between access to electricity in rural areas and female labour force participation.

- Hence, the variables were regressed at their first difference.

4.3 Bivariate Regression Analysis

Independent Variable	Coefficient Value (Adjusted R square= 0.13)
Change in access to electricity in rural areas	**0.04 (significant at 5%) (p-value= 0.041)**
Note: Dependent variable is female labour force participation and the number of observations is 24.	

- Value of β_1 is positive 0.04.

- This implies that if there is a positive change in the difference of access to electricity to rural areas by 1%, difference in female labor force participation will change positively by 0.04%.

- Since the t-statistics falls between 1.96 and 2.58 with p-value less than 0.05, the results are statistically significant at 5% with 95% confidence level.

4.4 Vector Autoregression (VAR)

Variable	Causal Flow	Coefficient Value (Lag 1)	Coefficient Value (Lag 2)
Access to electricity in rural areas	Access to electricity in rural areas → Female labour force participation (Y)	-0.007	**0.03 (not significant)**
Female labour force participation	Female labour force participation → Access to electricity in rural areas (Y)	**4.61 (significant at 5%) (p-value= 0.032)**	-1.32

- As per VAR, increasing access to electricity by 1% in rural areas increases female labour force participation by 0.03% at lag-2, however, the results were not significant.

- On the other hand, increasing the female labour force participation by 1% causes the access to electricity in rural areas to increase by 4.6% at lag-1 which is significant at 5%.
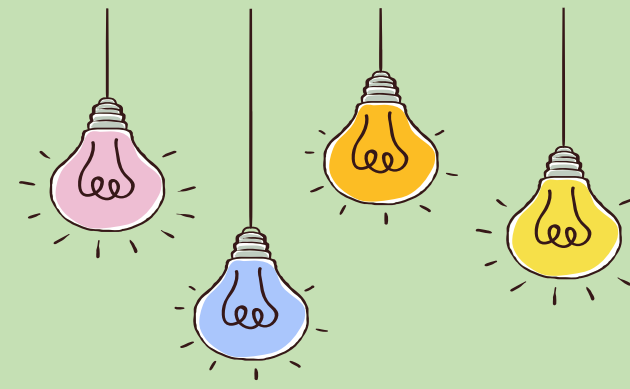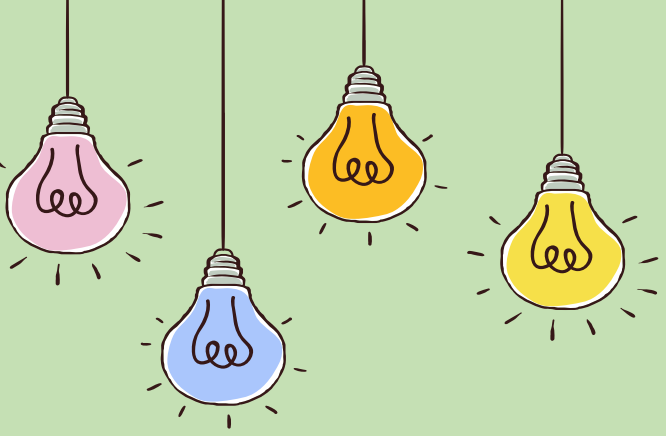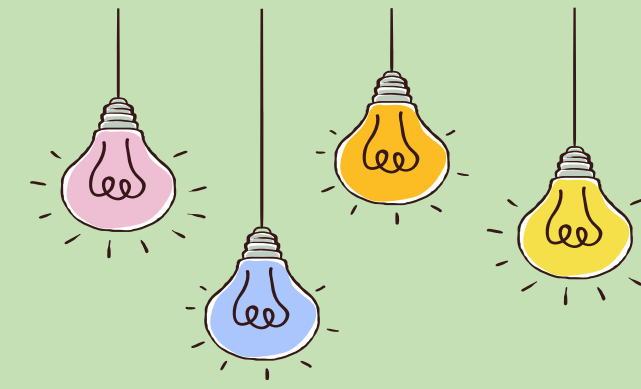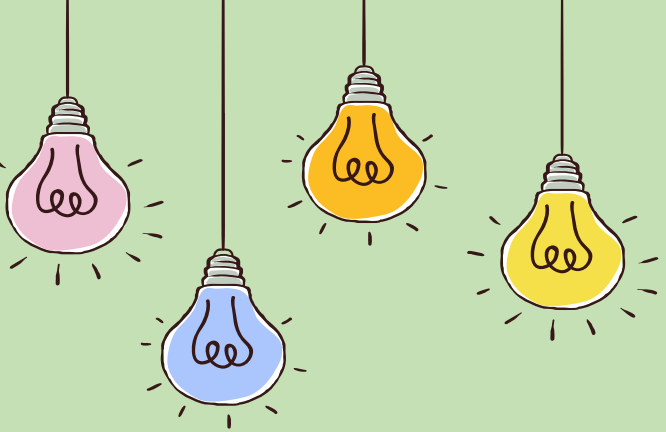
5. Discussion

5.1 Discussion

- The study suggests that increasing access to electricity in rural areas may bring about a positive difference in female labour force participation in Bangladesh.

- Employment will provide women with greater bargaining power allowing them to make decisions and improve their agency in rural areas.

- However, the provision of rural electricity alone will not make a significant statement in terms of its benefits trickling down equally between the male and the female of individual households.

- Additionally, the study observed that there is a significant increase in access to electricity in rural areas if more women are employed.

- Therefore, it may implicate that women's involvement in the supply, production, consumption and policy implementation of electricity may be integral to improve access to electricity in rural areas. However, this requires further research.

5.2 Limitations of the Study

- Due to the limitations involving resources and time, the study relies on secondary data and does not account for a household survey.

- A household survey could have provided more accurate statistics for a particular cohort of women residing in rural areas of Bangladesh.

- The empirical model is limited to a simple linear regression analysis, however, a multivariate analysis might have produced more significant results.

5.3 Recommendation

- Gender-inclusive decision-making process should be implemented to address the link between electricity and women's agency.

- Other recommendations may also include designing and developing energy schemes where female-headed households are primary beneficiaries of electricity while increasing accessibility and affordability of electricity.

- It is also important to build the capacity of women through training and awareness in utilising electrical appliances and technology.

Thank You