



North South Business Review

Anta Atalantia

Sakib Bin Amin

Impact of Energy Use on Women Empowerment in Bangladesh: An Empirical Analysis

Md Reaz Uddin

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EDITORIAL NOTES: MULTIDISCIPLINARY APPROACHES TO DEALING WITH DEVELOPMENT IN BANGLADESH

This issue captures multidisciplinary problems and strategic aspect to advance businesses and development in Bangladesh. The issue contains four scholarly studies that are focused on issues of energy use and women empowerment, determinants of entrepreneurial intention, links between oil price and the recent high inflation, and a review of the role of entrepreneurship incubation initiatives like the NSU Startups Next. By integrating these theoretical and applied research, this issue is expected to inform the contemporary debates and policy designs in the relevant area.

It is our earnest hope that the readers will find this issue relevant and informative as much as we did during our review of the papers for NSBR.

Mahmud Akhter Shareef, PhD
Managing Editor
NSBR

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I would like to thank Professor Helal Ahammad, Dean, School of Business & Economics, North South University and the Editor-in-Chief of NSBR for giving me the opportunity and support to edit this issue. As the Managing Editor, I was very encouraged by the many scholarly articles submissions in response to the call for papers for this issue. As usual, all submissions went through two-blind-review cycles before the final editorial decisions and acceptance. We gratefully acknowledge the support of the referees who reviewed the manuscripts and provided thoughtful and constructive suggestions for improving the quality of the papers; much obliged!

IMPACT OF ENERGY USE ON WOMEN EMPOWERMENT IN BANGLADESH: AN EMPIRICAL ANALYSIS

Anta Atalantia¹ and Sakib Bin Amin²

ABSTRACT

Bangladesh achieved significant progress in the energy sector from 2009 to 2019, and it has helped the country to improve the socio-economic conditions of women. However, to the best of our knowledge, there are no empirical time-series studies that explicitly address the relationship between electrification and women's empowerment. For an emerging country like Bangladesh, where women's work is often undervalued and society seems to be biased towards men, the demonstrated relationship between electrification and women's empowerment may have unveiled the immense impact that this might have had on the society. Hence, this paper investigates and quantifies the impact of electrification on women's empowerment, taking the general view that increasing electrification in Bangladesh results in empowering women in a community. Augmented Dickey-Fuller (ADF), Dickey-Fuller- GLS (DF-GLS), Johansen Cointegration methods have been used in this paper to explore this relationship. Moreover, the Granger-causality-test, Vector-Error-Correction Model (VECM) tests have also been applied to quantify this relationship. Our results support the view that energy use has a potential impact on the female laborforce in Bangladesh's both in the long and short run. Moreover, it also has a statistically significant effect on the female literacy rate in the long run. The Dynamic OLS (DOLS) results show that a 1-unit increase in energy consumption can lead to a 0.20 percent increase in female labor force participation in the long run other things remain unchanged. So, access to adequate electricity can provide the opportunity for employment creation to the poor female. To do so, the Bangladesh government should pay more attention to the development of off-grid electrification to better the socio-economic conditions of the unprivileged rural women in Bangladesh.

JEL codes: O11, Q43

Key Words: Macroeconomic development, energy, and macroeconomy

Field of Research: Economics

1. INTRODUCTION

In modern economics, energy is considered as the most vital strategic fuel for developing the socio-economic conditions of a nation. The industrial revolutions, exceptional economic growth, and major improvements in the standards of living all are, one way or the other, influenced by energy consumption facilitating the uptake of better technologies (Amin & Khan, 2020). The holds dispute the fact that the energy sector diversely constitutes a modest share of GDP in Bangladesh. The growth of an economy is directly related to the energy sector of the economy. Adequacy of electricity and development of the energy sector is a driver for the sustainable development of Bangladesh.

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At the same time, there is a nexus between women empowerment and usage of electricity. Women empowerment means creating an environment for women to exercise their capability, power and power and authority. According to Sundström et al. (2017), women's empowerment is as a universal standard term rather than the relative term of women to males in a society; is the capacity for women to make a better choice as an agency at home, and for social decision making. According to Kabeer (2005), empowerment is defined by three interrelated qualities. First of all, agency is the method through which wise decisions about one's future are made. Secondly, empowerment includes people's ability to make decisions as well as their sense of agency and self-worth. Thirdly, it entails how a society's institutions and relationships allocate power resource and opportunities. The successes made as a result of individual efforts to achieve empowerment are the result of resources and agency. Today it is known that women empowerment is one of the keys to economic growth. However, in today's world women from many countries face barriers to use electricity (Alstone, *et al.*, 2011). So, the increase of the electricity usage is paramount for socio-economic development of Bangladesh.

Women participation in the work place has significantly increased in Bangladesh; however, it is still severely less than the other developed countries. For example, in 2018 the labor force participation rate by female (15yr+ age) in Bangladesh is 35.85% whereas in the other developed countries like in Australia and The United States, the participation rate is 59.64% and 56%, respectively (World Development Index, 2018).

The development process of a country gets hampered for lack of energy sectors (Amin, 2015). The overburden of women works, and their lack of power and influence makes them miserable by lowering their health status and well-being. There are many vehicles through which women empowerment can be achieved. One of the main vehicles is energy use. Use of energy and electricity can be an instigator for economic growth and human development. Energy use and women empowerment can be closely related to the development of a country. Energy consumption can be the main source of empowering women, for which access to the energy for female of this country is also essential.

After the independence of Bangladesh in 1971, only 3% of the total population had access to electricity. This number has gone up to 59.6% in 2012 and 88% in 2018 (World Development Index 2018). As gender inequality is considerably high in Bangladesh, electrification specifically in women's daily and working life can eradicate gender inequality and, hence will empower women.

Barkat (2002) found out that women play a greater role in running a business than men in many cases. In this research, there are evidences for women empowerment and better household decisions making instances in the villages with electricity compared to the villages without electricity. There are many indicators of women empowerment among those; the main indicators will be described and examined in the context of a relationship among women empowerment and energy usage

Energy poverty is common phenomenon in countries like Bangladesh and, also in South Asia. It is often deduced that, poverty has a woman face. Khandker et al. (2009) studies the impact of electrification in rural area. The study finds that, access to improved lighting ensures extra hours of study and, as a result, better educational outcomes. Lighting also improves other household activities such as sewing by women, social gatherings and so on. Moreover, radios and television increase the accessibility of information to rural households. Besides electricity facilitates household's economic activities both from inside and outside the house hold.

In this paper, we will try to address the relationship between energy use and women empowerment in the Bangladeshi context. Through this research work, we would like to examine whether energy use can empower women. We are taking this hypothesis for Bangladesh because energy is a significant determinant for economic development. Since Bangladesh is looking forward to achieving its Sustainable Development Goals, energy is one of the important determinants to fulfill the goals. This paper detects if there is any relationship between the variables considered and women empowerment. As well as, how energy use can affect female empowerment in Bangladesh. Research results show that energy use has a potential impact on the female labor force both in the long run and short run in Bangladesh. It has also had an effective impact on the female literacy rate in the long run. These results support the previous result findings which we get from the literature review. And the results are different in case of women empowerment ensuring by energy usage. There are three main research questions:

- I. Is there any causal relationship between energy use and women empowerment in Bangladesh?
- II. Is there any long-run cointegrating relationship between energy use and women empowerment in Bangladesh?
- III. Is there any short-run relationship between energy use and women empowerment in Bangladesh?

We consider three variables: female literacy rate, female labor force participation rate, and fertility rate as the proxy variables of women empowerment. The rationale for using these variables is as follows.

Berik (2022) in her discussion paper for UNDP, proposed for replacing the United Nations Development Program's (UNDP) gender inequality index (GII) with two other gender index which are Global Gender Parity Index (GGPI) and Women's Empowerment Index (WEI). In WEI index there is dimension of female education and their reproductive choices to measure women empowerment. And in GII index there is dimension of female opportunities for paid work or financial inclusion which is also related to women empowerment as reflects the gender gap. That is why we measured the fertility rate as a measurement of women's freedom of reproductive choice, educational attainment to measure their capabilities to seek education and female labour force participation to study opportunities for paid work for women in to explore the impact of women's empowerment on the economic development of Bangladesh.

Data for variables are collected from the Data Bank of World Bank and from Bangladesh Bureau of Statistics (BBS). The variables are Energy use by women, Fertility rate, Female literacy rate, Female labor force. The rest of this study is organized as follows: Section 2 presents the literature review of energy use and women empowerment concept; Section 3 describes the energy scenario in Bangladesh; Section 4 presents an overview the women empowerment status in Bangladesh; Section 5 presents the methodology from various estimations. In Section 6, we undertake some robustness checks and present the results; Section 7 lays out the path from energy use to women empowerment in the society; and then finally we conclude the study in Section 8.

2. LITERATURE REVIEW

It is important to point out that there is lack of studies in Bangladesh where the impact of electrification and women empowerment have been explicitly discussed. UNDP (1995) mentions

that 70% people living under the poverty line are found to be women. Energy is considered as one of the vital components for alleviating poverty as well as gender discrimination. Besides, lives of the rural women also change as they start getting the access to adequate electricity.

Harbison and Robinson (1985) address the linkage between electrification and fertility rate in are India, Bangladesh, Thailand, Korea, Indonesia, Philippines, and the U.S. The study results show that higher level of electrification results in increase level of contraception prevalence. This relationship promotes women empowerment.

Dinkelman (2011) observes that women participation in the workplace in rural South Africa increases significantly 9.5% after 5 years of increase level of electrification. The study shows that female employment in South Africa increases by 13.5% with accessibility of electrification in the treated areas but the effect is insignificant for men. Although electrification is not directly related in generating new labor demands.

Grogan and Sadanand (2013) find that women in Rural Nicaragua are 23% more likely to work outside with the availability of electricity. The result findings show us that electrification increases the working time for both spouses. Similarly, Dasso and Fernandez (2015) indicate that women in Peru are more likely to be educated and employed after having electricity. Also, Van de Walle *et al.* (2013) observes that household electrification results in significant level on rise in consumption and earnings in rural India. On the contrary, Salmon and Tanguy (2016) find that electrification has positive impact only on husband's working time, on the other hand wives tend to increase leisure and household work. The number of unpaid work of women did not reduce with increased level of electrification. However, electricity has reduced the time allocation for specific household activities like firewood collection and others outside activities. Women would use this saved time to increase time for paid work. Barket *et al.* (2002) come up with the similar result in Bangladesh and Bhutan. Electrification helps the women from these countries to allocate their spare time from household work to generate income. This study also finds that electrified houses have higher literacy rate than non-electrified Bangladeshi houses both for women and men. In addition, a study by O'Dell shows that self-employed women with access to energy get twice of wage compared to the self-employed women without access to energy. The findings also indicate that average rural income of men and women is 10% higher with the accessibility of energy. Also a study conducted in Peru shows that children having solar energy at home are more likely to study in schools (Arraiz & Carero 2014).

Khandker *et al.* (2009) look upon many cases to elucidate the impact of electrification and energy use on household income, expenditure and education in Bangladesh. It shows positive impact of energy use on household income, expenditure and education. The household income raises 21% with 1.5%-point reduction in poverty per year. Khandker *et al.* (2012) compares the impact of electrification on poor and rich households in India. The study shows that rich households enjoy higher return in income and also higher level of educational output.

Winther (2008) examines the nexus between electricity and female empowerment in the village of Zanzibar, Tanzania. By the results of this we get to know that young girls and women save 25 hours on average with access of electricity. There is also equal number girls and boys attending schools. Also women save enough time to dedicate the time in income generating work. A study (UNDP/ESMAP 2004) on women in India finds that women are likely to spend 40 min less in household work like cooking and collecting firewood with electricity compared to households without electricity. Isfahani and Taghvatalab (2014) show that in Iran increase level of electrification results in decrease in fertility rate. We learn that after development in electricity took

place in 1979 in Iran it causes reduction in fertility rate and also it let to increase the literacy rate of women. Similarly, Fuji and Shonchoy (2015) also find that increasing electricity availability results in reducing fertility rate in rural area of Bangladesh.

Fuji and Shonchoy (2015) look explicitly at the relationship between fertility rate and rural electrification. This study shows that the use of electricity reduced the fertility rate among rural Bangladeshi women. From these two studies, we can implement that as electrification had successfully reduced fertility rate. And electrification is also related to women empowerment as decreasing fertility rate reflex the empowerment of women. So electrification and empowerment are related to each other. Jensen and Oster (2009) find that women in rural India who have access to television are less likely to face domestic violence. They are more likely to send their girls to schools and also intend to involve in income generating works.

From the above mentioned literature review, we clearly know that there is no such research which precisely studies the impact of energy use on women empowerment with time series analysis. In addition to that, there is a lack of variables added to each study for the determination of the impact on women empowerment. On the contrary, in this paper three proxy variables are taken as the measurement of women empowerment and to inspect the impact of energy use on it.

Granger Causality Test is used in this paper to see if there is any causal relationship between energy use and women empowerment. The findings support the hypothesis as a relationship is observed between energy consumption and women empowerment. We set our hypothesis relevant to our research questions. A set of null hypothesis is as follows,

H₁: Energy consumption cause women empowerment

H₂: Energy consumption has a potential impact on female labor force

H₃: Energy consumption has a potential impact on literacy rate

All the study and outcome from the literature review are combined in **Table 1**.

Table 1: Key Features of the Empirical Literature on Energy Use and Women Empowerment Revised

Author	Topic	Country	Methodology used	Key findings
Harbison and Robinson (1985)	Rural Electrification and Fertility Change	India, Bangladesh, Thailand, Korea, Indonesia, Mindanao Island, U.S	Panel regression analysis	The higher the level of electrification, the higher will be the level of contraception prevalence
Dinkelman (2011)	The Effects of Rural Electrification on Employment: New Evidence from South Africa	Africa	Instrumental variables strategy and a fixed effects approach	Instrumental variables strategy and a fixed effects approach
Grogan and Sadanand (2013)	Rural Electrification and Employment in Poor Countries: Evidence from Nicaragua	Nicaragua	Bivariate model structure	Nicaragua is 23 percent more likely to work outside of the home when there is electricity in the household
Dasso and Fernandez (2015)	The effects of electrification on employment in rural Peru	Peru	The difference in differences and fixed effect structural model	Electrification increases the labor demand more than labor supply
Van de Walle et al. (2013)	Long-Term Impacts of Household Electrification in Rural India	India	Time series econometrics analysis.	Household electrification brought significant gains to consumption and earnings, the latter through changes in market labor supply
Chowdhury (2010)	Impact of infrastructures on paid work opportunities and unpaid work burdens on rural women in Bangladesh	Bangladesh	Time series regression analysis by ordinary least squares estimation	Infrastructures expand the paid work opportunities for women in the non-farm sector.
Salmon and Tanguy (2016)	Rural Electrification and Household Labor Supply: Evidence from Nigeria	Nigeria	Copula-based bivariate hurdle model	Electrification only has a positive impact on the husband's working time
ADB (2010), Chowdhury (2010)	Impact Evaluation of Rural Electrification in Bhutan	Bhutan	Qualitative research with experimental, quasi-experimental and non-experimental methods	Electrification decrease the amount of time spent on collecting fuelwood by women

Author	Topic	Country	Methodology used	Key findings
Jensen and Oster (2009)	The Power of TV: Cable Television and Women's Status in India	India	A three-year, individual-level panel data set regression	Cable television connection in a rural area significantly decrease the domestic violence towards women
Fuji and Shonchoy (2015)	Fertility and Rural Electrification in Bangladesh	Bangladesh	Contemporaneous and retrospective panel data consumption model prediction	Electricity reduced fertility rate among rural Bangladeshi women
Winther (2017)	Women's empowerment through electricity access	Zanzibar, Tanzania	A qualitative oriented study	Women and girls save 25 hours on average because of electricity
Arraiz & Calero 2014	From Candles to Light: The impact of Rural Electrification	Peru	Panel data participation model	Children in SHS homes are more likely to study at home
Khandker et al. (2012)	Who Benefits from the Rural Electrification? Evidence in India	India	Cross-sectional survey analysis	Rich households enjoy more benefits than poor households
O'Dell et al. (2014)	Women, energy, and economic empowerment: Applying a gender lens to amplify the impact of energy access	Brazil	Posttest-only Control Group Operations Research Design	The average rural income of men and women who has access to energy is 10% higher
Barket <i>et al.</i> (2002)	Economic and Social Impact Evaluation Study of the Rural Electrification Program in Bangladesh	Bangladesh	Qualitative study	Electrified homes have a higher literacy rate for both men and women compare to non-electrified
Khandker et al. (2009)	Welfare Impacts of Rural Electrification: A Case Study from Bangladesh	Bangladesh	Cross sectional survey and analysis	Electrification increase 21 percent in income, reduces 1.5 percentage of poverty per year
Isfahani and Taghvata lab (2014)	Rural Electrification and Female Empowerment in Iran: Decline in Fertility and Rise in Literacy	Iran	A difference-in-difference method, instrumental variables to account for the potential endogeneity of electrification	Development in electricity decrease in fertility rate in women and also increase the literacy rate of women.

Source: Compiled by the authors

3. ENERGY SECTOR IN BANGLADESH: AN OVERVIEW

Bangladesh is an emerging country with a middle-income status. The per capita income of Bangladesh is 1203.03 USD (FY 2018). The GDP per capita of this country is 10% of the world's average. It wanted to decrease import bill after oil shock 1973 and as a consequence government of Bangladesh substituted natural gas as the main energy source (Amin at al., 2012). Bangladesh extracted about 722 million cubic feet natural gas in 2012 which is mainly consumed by internal markets.

According to International Trade Administration of USA the demand for electricity of Bangladesh is projected to be 34,000 megawatts (MW) by 2030. The estimated total investment to the next 15 years is \$70 billion. While as of June, 2018 installed generation capacity has increased to 18,753 MW. Bangladesh Power Development Board (BPDB) has implemented programs to expand generation capacity to 24,000 MW by 2021 and 40,000 MW by 2030.

The energy sector of Bangladesh is thriving. The country has started the plant called “Rooppur Nuclear Power Plant” which has the capacity of 2.4 gigawatt (GW) is expected to operate in 2023. According to BPDB in July 2018, 90% of the population had access to electricity. Still per capita energy consumption in Bangladesh is considered to be low. In November 2019, seven new power plant project has taken under consideration for future establishment. The details are in the chart below.

Table 2: New Power Plant Projects in Bangladesh 2019

Anwara Power Plant	Rangpur Power plant	Karnaphuli Power Plant	Shikalbaha Power Plant	Patia Power Plant	Tetulia Solar power plant	Gazipur Power Plant
300 MW	113 MW	110 MW	105 MW	58 MW	8 MW	100 MW

Source: The Daily Star, November 13, 2019

According to the statistics of Petro Bangla, the remaining reserved gas will last 2031 (Petro Bangla, 2015). The total installed generation capacity was 15821 MW whereas the total demand was 9479 in September 2017. To achieve 100% of electricity across Bangladesh only grid electricity is not enough. The government is now encouraging off-grid electricity production, for example, Solar Home systems, Micro Hydropower Plants, and Biomass energy can be a very productive way to lessen the shortage of electricity. In December 2018, a renewable energy policy passed and according to that policy, 10% of electricity generation will be done by 2020.

The main reasons for the shortage of access to electricity in Bangladesh are lack of proper distribution, poor quality of service and maintenance. The living standard of the country will be greatly improved if there is proper distribution of electricity to the energy deprived households. There is always a huge difference between the installed capacity and derated capacity of the electricity generation of Bangladesh mainly because some plants are out of function and some plants are out of maintenance. Finding new gas reserves can be a solution to this problem. We can compare the installed and derated capacity of electricity generation by showing a chart below.

Table 3: Electricity Generation in Bangladesh

Year	Installed Capacity (MW)	Derated Capacity (MW)
2014	10416	9821
2015	11534	10939
2016	12365	11170
2017	13555	12771
2018	15953	15410
2019	19290	18767

Source: Bangladesh Power Development Board, 2019

Electricity demand in Bangladesh expected to increase to 34,000 MW by 2030. In the country households and industries are the prime consumers. In 1971 only 3% of the population had access to electricity and this number has gone up to 88% in 2019. World Bank revealed that in 2018, 62% of total population of the country was rural people. And in 2015, 92% of urban and 67% of rural people had access to electricity. We can see a clear lack of energy distribution according to this data.

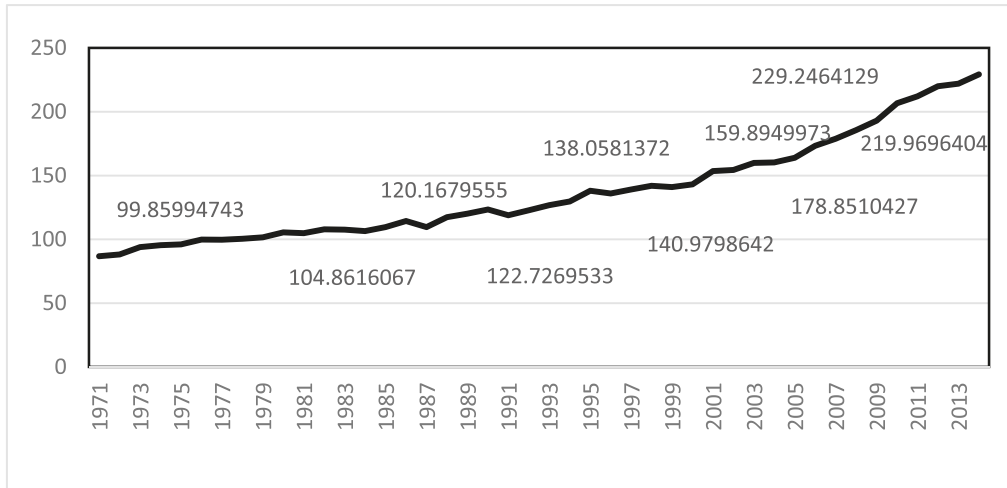
Table 4: Electricity Access in Bangladesh

Rural Access	Urban Access
2016	2016
94%	69%

Source: The Energy Progress Report, 2018

Gender equality is prerequisite for sustainable development of a country. However according to At Stone *et al.*, 2011 women from many countries still face discrimination to energy use. Rural women of Bangladesh are conceived in doing households works like burning fuels, dung crop residues etc. which causes air pollution and serious health hazards (Amin, 2015). So in this regard rural women should use renewable energy. And also saving time can be regenerated in income generating work. As Groote *et al.*, 2017, shows that lighting by electricity can help women to enterprise with the available spare time. From world development data we can see the consumption of energy use in Bangladesh in **Figure 1**.

Figure 1: Energy Use (Kg of oil equivalent per capita)-Bangladesh

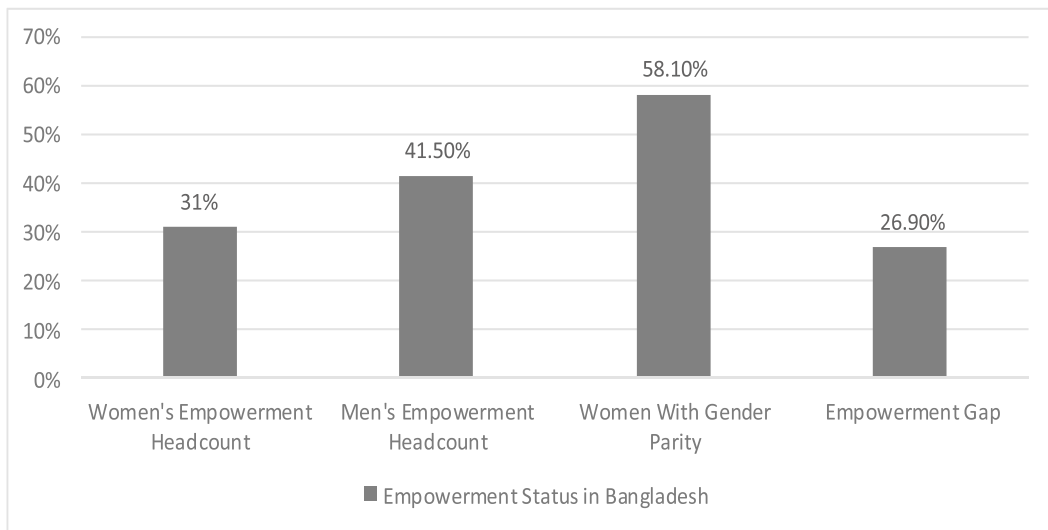


Source: World Development Index, 2018

4. WOMEN EMPOWERMENT STATUS IN BANGLADESH: AN OVERVIEW

According to the Bangladesh Institution of Health Science (BIHS) and International Food Policy Research Institution (IFPRI), only half of all the women in our country are empowered. On a national level, there has been a noticeable gain from 27.1 to 47.2 percent in women empowerment in the three or half-year (IFPRI, BIHS 2011/12 to 2015).

Figure 2: Empowerment Status in Bangladesh

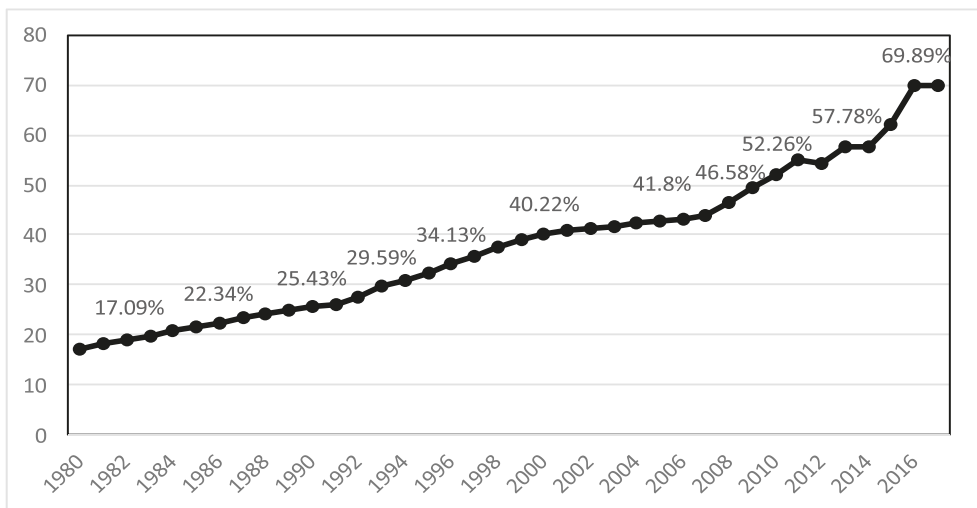


Source: IFPRI (2017), Abbreviated Women's Empowerment in Agricultural Index

For empowerment conditions in Bangladesh, we can see some results from a research based study. IFPRI designed the agriculture, nutrition, and gender Linkages (ANGeL) project, a two-year effort piloted by the Bangladesh Ministry of Agriculture through its Department of Agricultural Extension.

In this research paper for the measurement of the status condition of women in Bangladesh as mentioned earlier, we have taken three variables as the proxy variables for women empowerment conditions in Bangladesh. Literacy is one of the prime factors that ensure economic development in a nation. No country can achieve sustainable development by ignoring education

Figure 3: Female Literacy Rate Adults Percentage (age15+) Female-Bangladesh

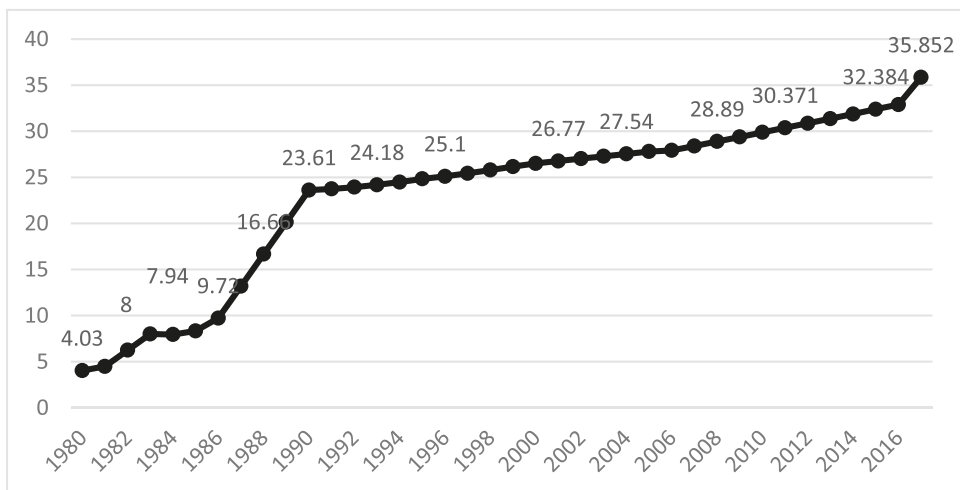


Source: World Development Index, 2018

According to the world development data index in 2018 the adult female (15+) literacy rate is 71.182%. Whereas in a developed country like China this number is 95%. This indicates that we are lacking behind the other developed countries in the female literacy rate. Even in developing countries like Ghana and Kenya, the female literacy rate is higher than in Bangladesh. To be a developed country Bangladesh government needs to provide the same facilities for rural areas and as well as for big cities. Rural people should be given access to Wi-Fi, electricity, and other energy resources.

Female labor force steadily grew between 2010 and 2017 because of the higher growth of the garment sector in Bangladesh (Asia-Pacific Employment and Social Outlook 2018). According to International Labor Organization Female participation in workplace has increased to 36.3 percent in 2017 from 33.2 percent in 2016. World development data shows that in 2019 the female labor force of the total labor force in Bangladesh is 30.52%. Though there is an increasing pace of female literacy rate from 2015 to 2019 still this number is severely poor than the other developed countries. For example, in a developed country like Australia in 2019 according to WDI the female labor force of total labor force is 46.418% which indicated the level of lacking in female labor force participation in Bangladesh.

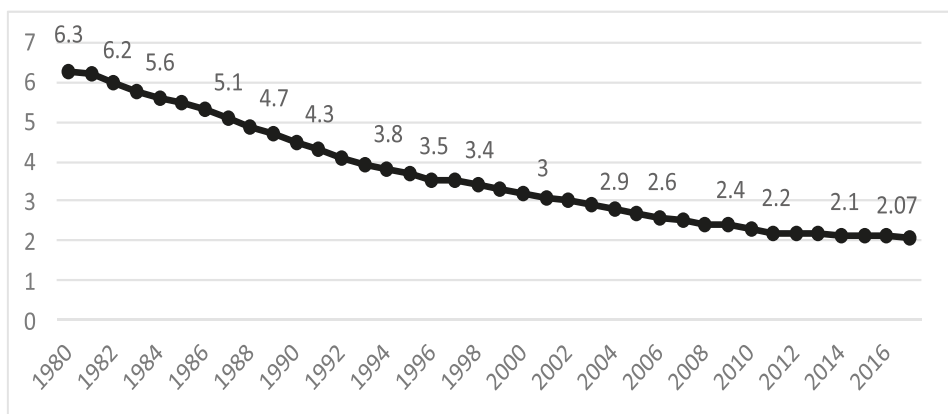
Figure 4: Female Labor Force participation (%) of Total Labor Force



Source: World Development Index, 2018

The total fertility rate has been stagnant in Bangladesh for the past ten years. In 2019, according to the World Development data fertility rate in Bangladesh was 2.01 children per woman. Over the last 50 years, the fertility rate of Bangladesh was declining at a moderating rate to shrink from 6.95 children per woman in 1970 to 2.01 children per woman in 2019. From the past year, the fertility rate has been decreased drastically in Bangladesh but still, the fertility rate is comparatively high then the other developed countries.

Figure 5: Fertility Rate Total (births per women) – Bangladesh



Source: World Development Index, 2018

For example, in a developed country like Australia, the fertility rate in 2017 according to the world development index was 1.765 births per woman whereas the number was 2 births per woman in

Bangladesh. From figure 4 we can see that the fertility rate in Bangladesh has decreased severally from 1080 to 2017. As the fertility rate is decreasing in Bangladesh it can be an important indication that the female literacy rate is affecting to empower the women of this country. This decreasing fertility rate is a good sign to encourage female labor force participation. So energy can play an important role to motivate the women through literacy, employment, and hence the fertility rate will further decrease.

According to the World Economic Forum Index, Bangladesh is leading the entire south Asian region in terms of gender equality. "Global Gender Gap Report 2020" shows that an overall score of 72.6% made Bangladesh the most gender equal country in South Asia (except Philippine). However, from the Global Gender Report of 2006 to 2020, the gender gap of Bangladesh increased in economic participation, educational attainment, health, and survival sectors. On the other hand, women's participation in political sectors increased from 2006 to 2020 according to the global report.

Table 5: Rank of Bangladesh in “Global Gender Gap Report 2020”

Sector / Year	Economic Participation by Women	Educational Attainment	Health and survival	Political Empowerment
2006	107 th	95 th	113 th	17 th
2020	14 th	120 th	119 th	7 th

Source: World Economic Forum, Countries: 153, 2020

From the chart, we can see that besides being 50th ranking worldwide in the global gender gap index ranking gender inequality is on the rise in Bangladesh. According to the 2017-18 Global Gender Gap Report, Bangladesh is falling behind in terms of female reprinting in parliament. Female representation in this case is only 10.7 percent as opposed to male participation which is 89.3 percent. Female health disparity is another sore point in Bangladesh.

5. METHODLLOGY AND DATA

This study employed series from 1985 to 2010 which were obtained from the World Development Index (WDI) and Bangladesh Bureau of Statistics. In providing the causal and cointegrating relationship between energy use by women and women empowerment, fertility rate (births per woman), female labor force participation rate (aged of 15+ female), female literacy rate (aged of 15+ in percentage) are considered as proxy variables for women empowerment.

5.1 The Models

In providing the theoretical framework for the relationship between energy use and women empowerment, standard functional models are specified bellow. Within this framework the impact of energy use on empowerment is usually modelled in three ways. Firstly how the energy consumption lead to increase in female labor force; secondly the impact of fertility deduction in

female labor force and thirdly how increasing literacy rate increase the labor force participation by women.

$$FLF_t = f(EUSE_t, FR_t) \tag{1}$$

$$FLF_t = f(EUSE_t, FLR_t) \tag{2}$$

$$FLF_t = f(EUSE_t, FR_t, FLR_t) \tag{3}$$

Here, FLF: Female labour force participation rate, EUSE: Energy use by women, FR: Fertility rate, FLR: female literacy rate.

5.2 Unit Root Test

To check for stationary variable Augmented Dickey-Fuller (ADF) has been conducted in this paper. Testing stationary properties of the variables is important because estimating regression using non stationary variable based on Ordinary Least Squares (OLS) results in spurious and inconsistent outcome (Gujarati, 2004). Macro-economic data are well known for being non-stationary. To solve this problem Augment Dickey Fuller test (ADF) is used for unit root testing of the variables.

5.3 Cointegration Test

In the case of non-stationary time-series process, where mean and variance change simultaneously overtime, cointegration tests allow us to check the long-run equilibrium. A well-known cointegration test is the Johansen test. The test uses linear combinations of the variables to estimate all the cointegrating vectors, generally if there are “n” numbers of variables with unit root process, then exists most n-1 number of unique cointegration vectors.

To apply this approach, an Unrestricted Vector of Autocorrelation of this form needs to be estimated:

$$\Delta x_t = \alpha + \theta_1 \Delta x_{t-1} + \theta_2 \Delta x_{t-2} + \theta_3 \Delta x_{t-3} + \dots + \theta_{k-1} \Delta x_{t-k+1} + \theta_k \Delta x_{t-k} + u_t \tag{1}$$

In this equation,

Δ = difference operator,

x_t = (n-1) vector of non-stationary variables in levels

u_t = (n-1) vector of random errors.

θ_i = information on the long-run relationship between variables.

$\theta_i = 0$ means, the variables are not cointegrated.

Rank, $r = 0$ means, there is the existence of one cointegrating vector.

$1 < r < n$ means, there are multiple cointegrating vectors are available.

5.4 Causality Tests

One of the most used hypothesis tests in the time series analysis is the Granger casualty. Broadly speaking, Granger causality determines whether one variables has the predictive power to describe other variable suggesting policy implications, especially in the area of macroeconomics.

Two sets of the equation have been used for conducting this study:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \dots + \alpha_i x_{t-i} + \beta_1 y_{t-1} + \dots + \beta_i y_{t-i} + u_t \tag{2}$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \dots + \alpha_i y_{t-i} + \beta_1 x_{t-1} + \dots + \beta_i x_{t-i} + v_t \tag{3}$$

All possible (x,y) series in the group represents that the F-statistics are the Wald statistics for the joint hypothesis, $\beta_1 = \beta_2 = \beta_3 = \dots = \beta_i = 0$.

An alternative to Granger causality is the VECM approach, which takes into account both short- and long-term effects. The vector error correction model (VECM) that adjusts for both short-run changes in variables and deviates from equilibrium when one or more cointegrating vectors are detected for a set of variables. Causality hypothesizing in a multivariate framework can be estimated by the following VECM equations:

$$\Delta Y = \alpha + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + \sum_{j=1}^n \gamma_j \Delta x_{t-j} + \sum_{k=1}^0 \delta \Delta M^s + \sum_{l=1}^p \zeta \Delta N + \theta Z_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta X = \alpha + \sum_{i=1}^m b_i \Delta Y + \sum_{j=1}^n c_j \Delta x_{t-j} + \sum_{k=1}^0 d \Delta M^s + \sum_{l=1}^p e \Delta N + f Z_{t-1} + \varepsilon_t \quad (5)$$

Here, Z_{t-1} = error-correction term.

The error-correction term measures the deviations of series from long-run equilibrium relation. Error correction term avails the adjustment of Y and X towards their respective long-run equilibrium. VECM test represents the difference between the long run and short run dynamic relationship.

DOLS test helped us in this study to deal with small sample size and biases. It corrects the regressor endogeneity by lags and leads. DOLS test estimates long run equilibrium with the same or different ordered variables. As in this paper our sample size is limited we applied DOLS test to avoid faulty estimation.

$$Y_t = \beta_0 + \beta_1 X_{1,t} + \beta_2 X_{2,t} + \dots + \beta_k X_{k,t} + \sum \alpha_{i\Delta} X_{1,t-i} + \sum \gamma_{i\Delta} X_{2,t-i} + \dots + \sum \delta_{i\Delta} X_{k,t-i} + \varepsilon_t$$

Here in the aforementioned equation,

Y_t = dependent variable where regressors X_t , $t = 1, 2, 3, \dots, n$.

We also performed the **CUSUM** test to look for any systematic changes or movements that might indicate structural instability.

6. RESULTS

6.1 Unit Root Results

Augmented Dickey Unit Root statistics and corresponding the critical values for the variables in their level and first difference forms are written below in **Table 6A**.

This study uses a time series model. One method is to include a relatively long lag length to select by t-statistics. If the t-statistics using lag P comes out insignificant at some specific critical value, then the regression can be established using a lag length of p-1 until the lag can become significantly different from zero. Different lags have been taken to check whether the variables are stationary or not. The variables are stationary at the first difference except the rate of female literacy and female labor force. Dickey Fuller- GLS (DF-GLS) Unit Root test. **Table 6B** shows that above variables are stationary at the first difference.

Table-6A: Augmented Dickey-Fuller Unit Root Test for the Variables

Panel 1: Levels			
Variable	ADF Statistics (Only Constant)	ADF Statistics (Constant & Trend)	Decision
EUSE	1.61696(0.9969)	-1.494334 (0.8043)	Non Stationary
FLF	1.677246 (0.991)	-0.026623 (0.995)	Non Stationary
FR	-0.35770(0.901)	-2.27137(0.432)	Non Stationary
FLR	-1.506(0.513)	-1.899997(0.624)	Non Stationary

Panel 2: First Differences			
Variable	ADF Statistics (Only Constant)	ADF Statistics (Constant & Trend)	Decision
EUSE	-6.221542(0)	-7.095622(0.0)	Stationary
FLF	-1.66147(0.437)	-1.727299(0.04)	Non Stationary
FR	-2.145260(0.23)	-2.022114(0.5)	Non Stationary
FLR	-5.40991(.0002)	-5.896111(.0004)	Stationary

Table-6B: DF-GLS Unit Root Test

Panel 1: Levels			
Variable	DF-GLS Statistics (Only Constant)	DF DLS Statistics (Constant & Trend)	Decision
FLR	0.557576 (0.25)	-3.394816 (0.03)	Non Stationary
FLF	-1.096390(0.55)	-1.902962 (0.95)	Non Stationary

Panel 2: First Differences			
Variable	DF-GLS Statistics (Only Constant)	DF DLS Statistics (Constant & Trend)	Decision
FLR	-1.736960(0.02)	-3.196571(0.00)	Stationary
FLF	-3.299543(0.01)	-3.540138(0.06)	Stationary

6.2 Cointegration Results

The cointegration test results show that all the variables used in this paper are cointegrated in the long run (Table 7A, 7B and 7C)

Cointegration Test for Model 1				
Hypothesized No. of CE(s)	Trace Statistic	Probability	Max-Eigen Test	Probability
None	52.35558	0.00	35.31510	0.00
At most 1	17.04048	0.03	15.21036	0.04
At most 2	1.830124	0.17	3.841466	0.17

Cointegration Test for Model 2				
Hypothesized No. of CES	Trace Test	Probability	Max-Eigen Test	Probability
None	45.90721	0.00	35.31396	0.00
At most 1	10.59325	0.10	10.15287	0.10
At most 2	0.440378	0.27	0.440378	0.57

Cointegration Test for Model 3				
Hypothesized No. of CES	Trace Statistic	Probability	Max-Eigen Test	Probability
None	93.05777	0.00	37.19963	0.01
At most 1	55.85814	0.00	28.83685	0.02
At most 2	27.02129	0.10	17.19803	0.11
At most 3	9.823259	0.13	9.823259	0.13

The Johansen cointegration test results indicate that our variables have cointegrating relationship.

6.3 Granger Causality Results

Table 8 shows a unidirectional causality from female labor force participation to energy use. That means the higher the rate of female labor force the higher the energy use by women. From table 8 we can see that probability is significant and we cannot reject the null hypothesis that the female labor force does not granger cause energy use to increase or decrease. The result shows that the causality direction runs from energy use to female labor force participation. It goes hand in hand with the concept that energy use directly increases the rate of labor force participation rate. With the help of the energy, the female will be able to get the opportunity to work more hence participation in the female labor force will increase. There is unidirectional granger causality from female energy use to female literacy rate as we can see that the probability for the direction. As energy consumption rises, for example, the female will be able to study for extra hours daily.

Lugauer et al. (2010) show that the increased level of married women using energy through household appliances has a positive significant effect on female labour force participation in U.S. states. This also aligns with the findings of this research paper.

Granger causality test reveals that there is no causal relationship between energy use and fertility rate. This relationship may not be seen due to the indirect relationship between them by other variables that are not included in this research task.

There is a unidirectional Granger causality between female literacy rate to female labor force participation. As females get literate and the female literacy rate increases, it encourages them to get involved in the labour force sector for earning and doing productive work. As a result, female labor force participation rate increases. There is enormous literature to support these results. Likewise, Ince (2010) shows that increasing female education results in decreasing fertility rate and mortality rate while it positively affects the female labor force and literacy in Turkey.

Table 8: Granger Causality Test Results

Hypothesis	F-Statistic	P-Value	Granger Causality
FLF → EUSE	0.62933	0.5437	Unidirectional
EUSE → FLF	9.70809	0.0012	
FLR → EUSE	0.31085	0.7365	Unidirectional
EUSE → FLR	2.54798	0.1046	
FR → EUSE	0.55597	0.5826	No Causality
EUSE → FR	0.49013	0.6201	
FLR → FLF	8.18984	0.0027	Unidirectional
FLF → FLR	0.99946	0.3866	
FR → FLF	8.81044	0.0020	Unidirectional
FLF → FR	0.20807	0.8140	
FR → FLR	4.76903	0.0210	Bidirectional
FLR → FR	4.55771	0.022	

The fertility rate and female literacy rate have a bidirectional Granger causality. As female get more literate, it affects the fertility rate. With the increasing literacy rate fertility rate tends to decrease and thus emerge women empowerment.

6.4 VECM Results

After conducting the Granger causality test we have inspected VECM test. **Table 9** shows the results of VECM test. Energy use has a potential impact on the female labor force in the long and short run in Bangladesh. It has also an effective impact on the female literacy rate in the long run.

Our results show a causal relationship between the female literacy rate and the female workforce. The results show that energy consumption has a long-term and short-term impacts on Bangladesh's female work force.

A recent study by Amin and Mahmud (2017) examined the link between energy usage and fertility changes in rural areas. Findings from the current study confirm those of the previous study in which there is no causal relationship between fertility rate and women's energy usage. Because of this paper's focus on energy usage in Bangladesh, the overall conclusions differ from those of Amin and Mahmud (2017).

Table-9: VECM test results

Variable (Logarithm Transformation of the variable)	Null Hypothesis	Chi-square statistic	P-Value	Conclusion
FLF	FLF→ EUSE	1.060036	0.5886	No Causality found
FLR	FLR →EUSE	0.590556	0.7443	No Causality found
FR	FR→ EUSE	7.013741	0.0300	Causality found
EUSE	EUSE→ FLF	10.97352	0.0041	Causality found
FLR	FLR →FLF	9.237167	0.0099	Causality found
FR	FR →FLF	3.420787	0.1808	No causality found
EUSE	EUSE→ FLR	1.438826	0.4870	No causality found
FLF	LNFLF→ LNFLR	0.523422	0.7697	No causality found
FR	LNFR →LNFLR	0.348164	0.8402	No causality found
EUSE	EUSE→FR	2.022113	0.3638	No causality found
FLF	FLF→ FR	2.234887	0.3271	No causality found
FLR	FLR →FR	3.694301	0.1577	No causality found

From VECM results we can see that energy use has significant correlation with female labor force and fertility rate. Added to that beside widely established relationship between female labor force and fertility rate our research findings shows contradictory results that female fertility rate and female labor force has no causality because it shows that the causality runs from female literacy rate to female labor force. Primarily the main driver force for female labor force is female literacy but not fertility rate. Hence fertility rate and female labor force has no causal relationship regarding VECM test results.

6.5 DOLS Results

In this section, as per the three models, we can see that increase in one unit of energy consumption can lead to an increase in female labor force participation by 0.13-0.20 percent, one unit change in fertility rate can lead to a decrease in the female labor force by 0.60- 1.28 percent, one-unit literacy rate can lead into increase labor force participation rate by 0.14-0.26 percent, keeping all other things constant. From **Table 10**, all the regression diagnostics tests (Adj-R2, J-B, A-C, long run variances) show that all three models represent the relationships between the dependent and the independent variables. Samad and Zhang (2019) elucidate that energy consumption by women can increase women's empowerment through increased labor force participation which supports DOLS results.

Table 10: DOLS Estimation Results

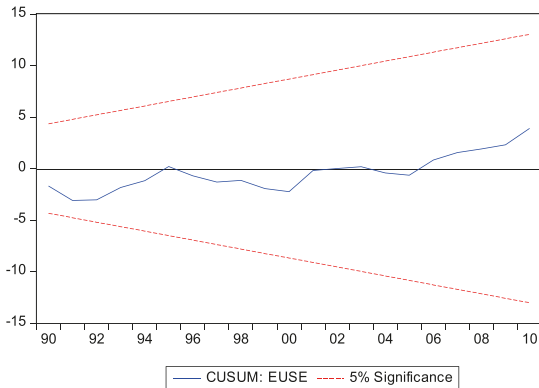
Variables	Model 1	Model 2	Model 3
EUSE	0.13 (0.02) ^{***}	0.10 (0.02) ^{**}	0.20 (0.02) ^{**}
FR	-0.60 (0.25) ^{**}		-1.28 (0.20) ^{**}
FLR		0.14 (0.02) ^{***}	0.26 (0.03) [*]
C	19.56 ^{***}	15.08 ^{***}	16.04 ^{***}
Adj-R ²	0.99	0.99	0.98
J-B	1.24	1.63	0.31
A-C	3.38	1.52	4.40
LRV	0.02	0.01	0.14

Note: Standard errors are in parenthesis. ***, **, and * show significance at 1 and, 5 and 10 percent respectively. J-B and AC refer Jarque-Bera and Autocorrelation tests, respectively. Both tests have been done in the residuals of the regressions. The optimal lag for each model is selected by AIC Criterion.

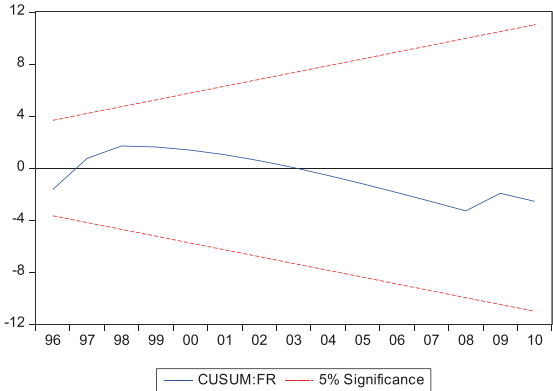
6.6 The CUSUM Test Results

The CUSUM test results of each variable show that the plots stay within 5 percent critical value, indicating that the variables used in this empirical analysis are stable both in terms of systematic and sudden movements.

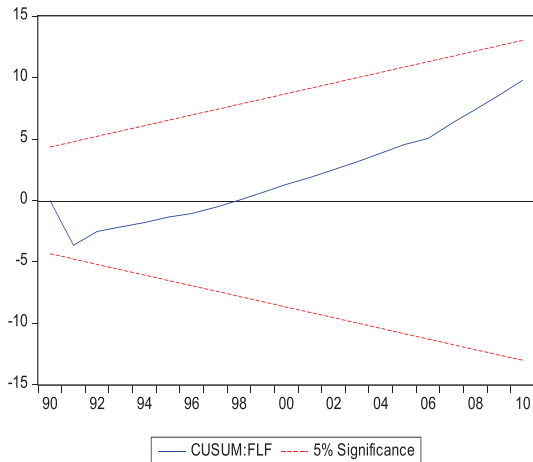
Figure 6: Stability of the Variables



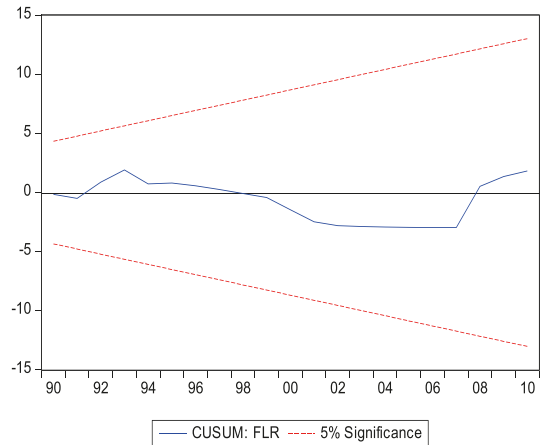
Graph 1: CUSUM Test for Energy use by female



Graph 2: CUSUM test for Fertility Rate



Graph 3: CUSUM test for Female labor force

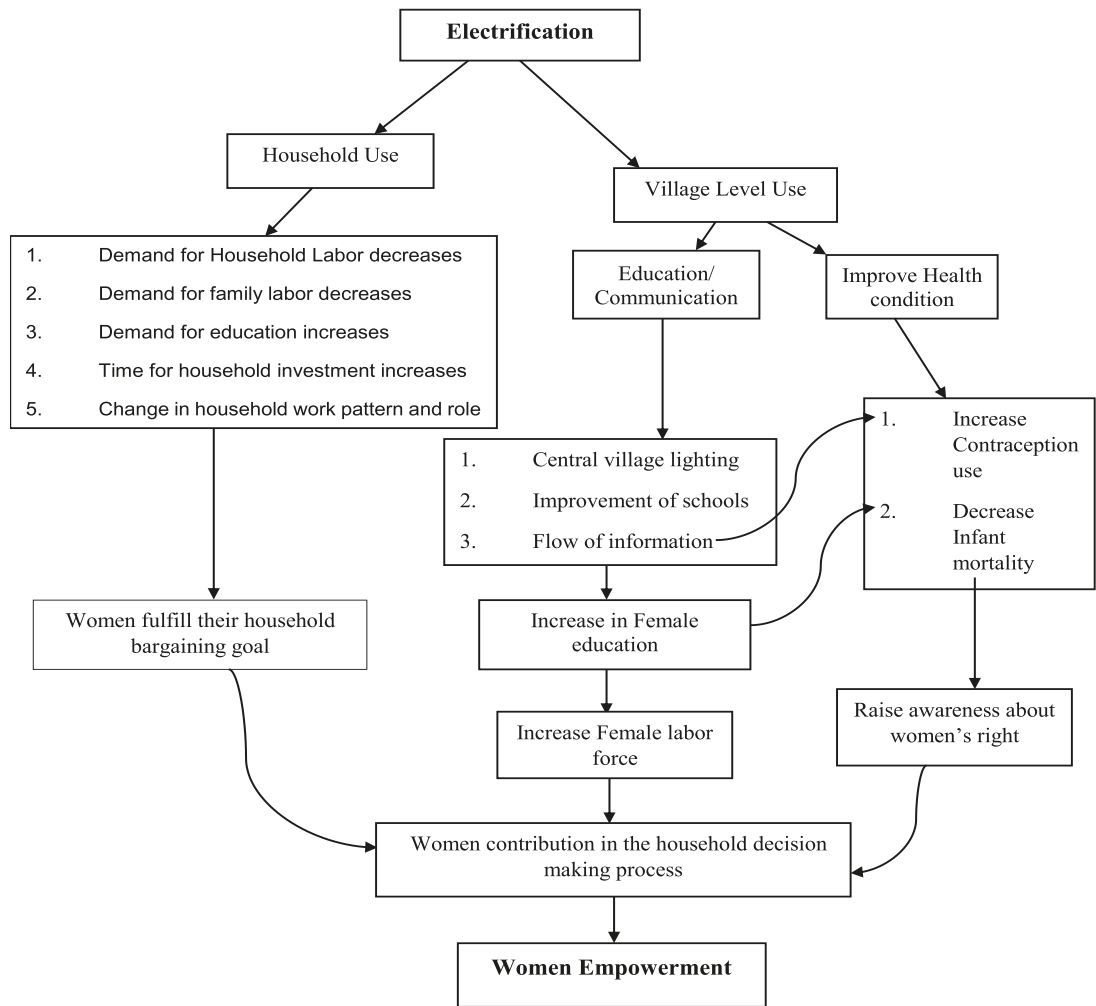


Graph 4: CUSUM test for Female literacy rate

7. A FRAMEWORK OF THE IMPACT OF ENERGY USE ON WOMEN EMPOWERMENT

Harbison and Robinson (1985) provide a useful foundation to the development of a framework. The framework is about the impact of energy use on fertility rate. According to this research paper, energy consumption is both a community level and household level variable. **Figure 7** presents a preliminary version of the framework which includes directions of impacts on women empowerment from both of these levels. This is a slightly different and extended version of a framework than that of Harbison and Robinson (1985).

Figure 7: The Impact of electrification on women empowerment



Source: Combined by Author

According to the figure, there are two main pathways through which energy consumption impacts women's empowerment.

1. Household Use: Energy consumption at the household level reduces the time for household chores hence women can invest their time in literacy and labour force participation. This will create confidence in women for greater bargaining power. The well-being of families increases, and children's educational and health outcomes are better when women have more negotiating power in household decisions.

2. Village Level Use:

i) Education:

In the village level, through electrification, like central village lighting, the improvement of schools can increase the communication outcome by the flow of information in the school. This creates awareness of household bargaining power among teenage girls in the school. Increasing education will increase women's participation in labor force (VECM test results, Table-9). As a result, women's contribution to the family will increase household decision-making power.

ii) Improved Health Condition:

As electrification at the village level increase, the educational attainment of women. It creates health awareness through communication and the flow of information in the school. As a result, the fertility rate and mortality rate of women decrease through household decision-making power. Women's agency develops through this process results in women's empowerment.

8. CONCLUSIONS

In this paper, we have analyzed the impact of energy use on women empowerment. We found that energy use has a potential impact on the female 'laborforce' both in the long run and the short run in Bangladesh. It also had considerable impact on the female literacy rate in the long run. These findings support the previous results drawn from our literature review. That is this paper validates that energy consumption can ensure women's empowerment, which also supports the previous literature. Energy use can ensure development in the remote and rural areas of Bangladesh. Rural women can take advantage of the accessibility of energy and electricity to complement their family income. Energy can have the potential to affect female empowerment.

Our research findings indicate that energy can play a vital role in ensuring female empowerment. Especially in terms of the female laborforce participation, energy use can increase this causality and contribute to the development of our country. It can also increase the female literacy rate for which we can have a bright literate generation. Electrification can enhance the literacy rate and thus can stimulate the rate of female labor force participation. For future economic development, our country needs to empower women. Although the government is doing well in energy access, the government should consider more rigorous efforts to keep this momentum going. In addition to that, from an energy review of Bangladesh 2019, we get to know that 79% of the connected consumers suffer from a lack of electricity supply. So the government can encourage and can focus on the off-grid electrification so that all the female of Bangladesh can be empowered through energy usage.

One of the main limitations of this research paper is that there is a small number of variables and data availability from 1980 to 2010. This paper can be further expanded in the future by analyzing the research work with more variables. On the other hand, this paper can even be more expanded by modeling energy use and women empowerment for other South Asian countries with the help of panel data set. Having an insight into the aggregate energy use and women's condition of the South Asian countries can reveal immense scopes for achieving collective goals both in terms of economic and social outcomes.

There should be well crafted measured policies to ensure women empowerment in the country. The policy's objective should be to promote women's financial freedom, development, and

empowerment. The Policy should be extensively applied in order to promote active engagement from all stakeholders in order to achieve its objectives.

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Statistical Description

	Fertility Rate	Energy use by women	Female labor Force	Female literacy Rate
Mean	3.638684	66.89469	23.13063	37.89621
Median	3.350000	67.05770	25.97500	38.28000
Maximum	6.300000	113.5196	35.85200	70.08000
Minimum	2.070000	0.000000	4.030000	17.09000
Std. Dev.	1.341077	26.83382	8.860237	14.75751
Skewness	0.567413	-0.721747	-0.978557	0.464302
Kurtosis	2.042786	4.107230	2.703789	2.340619
Jarque-Bera	3.489809	5.240257	6.203562	2.053721
Probability	0.174662	0.072794	0.044969	0.358130
Sum	138.2700	2541.998	878.9640	1440.056
Sum Sq. Dev.	66.54403	26641.99	2904.641	8058.014
Observations	38	38	38	38

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AN INVESTIGATION OF THE MODERATING EFFECT OF SELF-EFFICACY AND ALERTNESS ON REGULATIVE, COGNITIVE, AND NORMATIVE DETERMINANTS OF ENTREPRENEURIAL INTENTION

Md Reaz Uddin¹, Md Shaiful Islam²

ABSTRACT

The purpose of this study is to investigate the relationship between institutional environment and entrepreneurial intentions and to determine whether self-efficacy and alertness moderate this relationship. Drawing on institutional theory, we set hypotheses and test them by applying regression based on a primary dataset of students collected from the local public and private universities. The results show that cognitive institutions positively influence entrepreneurial intentions; thus, they inspire students to set up more entrepreneurial minds. Furthermore, we find direct positive effects of entrepreneurial alertness and self-efficacy on entrepreneurial intentions. Still, we do not see any moderating (interaction) effects of the institutional environment on entrepreneurial intentions. The research results suggest that Bangladesh needs to develop cognitive institutions to encourage students' entrepreneurial intentions. Future research should be expanded for retesting the empirical validity of the included moderators by using longitudinal datasets.

Keywords: Entrepreneurial intentions, institutional environment, alertness, self-efficacy.

1. INTRODUCTION

Entrepreneurial intention is the propensity and mindset of individuals to be engaged in entrepreneurship. The intention is such a state of the mindset that inspires individuals to commit all sorts of endeavors, thinking, and actions toward entrepreneurial behavior willingly and enthusiastically (Bird, 1988; Donaldson et al., 2021). Research on entrepreneurial intentions is a promising area of the entrepreneurship literature stemming from the publication of Shapero's seminal work close to forty years ago (Shapero, 1984). Since then, scholars have investigated intentions from various perspectives, focusing mainly on personality and cognitive factors (Liñán & Fayolle, 2015). Still, only such factors are inadequate to comprehend the complexity of factors shaping entrepreneurial intentions. Veciana & Urbano (2008) point out the importance of studying relationships between institutions and entrepreneurship that carry significance for a country. Individuals do not exploit opportunities in a vacuum; their exploitation capabilities also depend on their social, political, and institutional environment (Baker et al., 2005; Urbano et al., 2019). This is why investigation of the roles of the institutional environment in forming entrepreneurial intentions is crucial (Fayolle & Linan, 2014). Scholars have already conducted studies using different frameworks and measures of institutions (Engle et al., 2011; Shahid et al., 2018; Kumar & Das, 2018; Duong et al. 2020; Yukongdi & Lopa, 2017; Arasti et al., 2012) but the obtained results are somewhat mixed. There is little consensus about which institutions influence the creation of

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entrepreneurial intentions most significantly. Scholars in most previous studies relied on limited variables such as norms or economic regulations, which unfortunately fail to capture institutions characterized by multiple dimensions (Fernández-Serrano et al., 2018). A proper perspective is necessary for comprehending the dynamic environment that affects entrepreneurship in a society and economic system, and in this consideration, a three-dimensional framework consisting of regulative, cultural-cognitive, and normative pillars seems to be suitable (Valdez & Richardson, 2013; Busenitz et al., 2000; Kostova, 1997; Scott, 1995). Therefore, drawing on institution theory, the article investigates how regulative, normative, and cognitive institutional environments affect entrepreneurial intentions.

Entrepreneurial intention is a complex phenomenon, and we need to investigate considering the multi-facet interactions among individuals' attitudes towards starting a business and the surrounding context (Schmutzler et al., 2019). Scholars have already begun to examine the reciprocal interactions between individuals and contextually embedded phenomenon and their impacts on entrepreneurial engagement (Abebe & Alvarado, 2016; Hain et al., 2016). In line with the requirements for a proper explanation of entrepreneurial intentions, we interact individual-level variables with institutions and examine their effects in a multidimensional research design. Many variables can be considered in this respect, but we have selected self-efficacy and entrepreneurial alertness, considering their affinity with entrepreneurship. Entrepreneurs must handle different tasks and various difficulties in running a new venture. Self-efficacy is the confidence to complete roles and tasks (Chen et al., 1998). Entrepreneurial self-efficacy is related to self-belief that directs individuals to choose a future career path. It is considered the most reliable component to predict an individual propensity for a profession (Banuara, 1987). This is why self-efficacy is the central element of entrepreneurial intentions (Diaz-Casero et al., 2012). Besides, we select another valid variable which is entrepreneurial alertness. To a greater extent, contingent on the competencies of recognizing new opportunities and alertness, entrepreneurial success has a connection with opportunity identifications (Gaglio & Katz, 2001; McCaffrey, 2014; Pandit et al., 2018; Sharma, 2019). Considering the implications of entrepreneurial alertness on exploiting business opportunities and its subsequent influence on starting a new venture, we find this variable a crucial determinant explaining entrepreneurial intentions. To integrate self-efficacy and entrepreneurial alertness within the model of entrepreneurial intentions, we ask: do self-efficacy and alertness moderate the relationship between institutional environment and entrepreneurial intentions?

The study contributes to the existing entrepreneurship literature in several ways. First, we develop and test a model of entrepreneurial intentions incorporating a series of variables to capture the complexity of the surrounding institutional environment that affects the individuals' attitudes towards entrepreneurship. This helps us understand better which components of the national institutional environment determine the decision of individuals to consider entrepreneurship career pathways. Second, this study clarifies whether the institutional environment is sufficient to explain the complexity of entrepreneurial intentions entirely or whether it needs to be combined with other individual-level characteristics. Studies on how contextual and personality variables simultaneously affect entrepreneurial intentions are still scarce (Yukongdi & Lopa, 2017; Looi, 2020). So, the study also contributes to reducing this gap in existing literature. Thirdly, this study has been conducted in Bangladesh, one of the emerging countries located in South Asia, where the context is characterized by resource constraints (Mair & Marti, 2009) and poverty (World Bank, 2017). According to the World Bank's Country Overview (2019), Bangladesh needs to generate productive employment opportunities to absorb new entrants and tackle youth unemployment, which is apparently on the rise. This situation necessitates the further development of entrepreneurial activity (Chowdhury, 2007), which can contribute to creating productive employment opportunities (Dvoutely et al.,

2018). This study is significant for Bangladesh as it focuses on answering questions related to the importance of the future development of institutional pillars to inspire people to become entrepreneurs and contribute to the country's economic growth.

The paper is structured as follows. After the introductory section, the theoretical framework and hypothesis development are presented in detail. Subsequently, methodology, data analysis and results of hypothesis testing are reported. Finally, this study discusses the results, implications, limitations, and future research recommendations.

2. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Entrepreneurship commences on opportunities, and the institutional environment generates, accelerates, restricts entrepreneurial opportunities, and influences the nature and characteristics of entrepreneurial activity (Dvouletý 2017; Urbano et al., 2019). The existing literature shows institutional theories frequently frame entrepreneurship research (Bruton et al., 2010). Institutions are defined in different ways. According to Meyer and Rowan (1977) and Powell and DiMaggio (1991), an institution is the reutilized, commonly accepted ideas, credence and behaviours used in society. Institutions are the guiding principles in society, shaping human interactions that create barriers and opportunities (North, 1990). Parsons (1990) defined that institutions are related to normative rules that regulate relationships among individuals. Scott (2013) provides an elaborative definition of institutions that cover rules, regulations, norms, values, and cultural beliefs, which integrate with daily activities and resources provide stability and meaning to social life.

2.1 Regulatory Institutions and Entrepreneurial Intentions

The regulative dimension is one of the pillars of the institutional environment. It consists of strict rules, policies, and guidelines to facilitate the efforts of entrepreneurs to acquire resources for new ventures or the growth of the existing businesses (Busenitz et al., 2000). The government can inspire individuals to start their own businesses by formulating rules and public policies. One way is to ease restrictions and regulations such as new venture starting time, licensing conditions and expenses, reducing mandatory capital requirements of a new firm (van Stel et al., 2007). It follows from this argument that the decision of individuals to become entrepreneurs is likely to be discouraged if they need to maintain strict rules and formalities (Begley et al., 2005; Urbano et al., 2019). The governments may also introduce policy actions providing individuals financial (credit guarantees, soft loans, or subsidies) and nonfinancial (entrepreneurial training and education, counseling, or advisory services) aid to stimulate entrepreneurial activity. Thus, these policies may contribute to entrepreneurship development in the respective countries (Gnyawali & Fogel, 1994; Ho & Wong, 2007; Spencer & Gomez, 2004; van Gelderen et al., 2006; Dvouletý et al., 2020). Therefore, it can be hypothesized that:

H₁: There is a positive relationship between the regulative institutional environment and entrepreneurial intentions.

2.2 Normative Institutions and Entrepreneurial Intentions

Generally, people tend to replicate established behaviours, which is also applicable to entrepreneurship and the formation of entrepreneurial intentions. The normative dimension indicates how people recognize and value creativity and innovation (Busenitz et al., 2000). Accordingly,

whether entrepreneurs and self-employed persons are admired and supported depends on the normative institutional environment (Nguyen et al., 2009). When in a society, where entrepreneurship is valued and accepted publicly as an equal career preference; people tend to be entrepreneurs, resulting in higher entrepreneurial intentions. The higher acceptance of entrepreneurial values by society, the closer social groups such as family, relatives, and spouses, and the more distant social references such as national culture contribute to forming the individuals' entrepreneurial intentions (Stenholm et al., 2013; Fernández-Serrano et al., 2018). Therefore, the normative dimension critically contributes to guiding and sharing entrepreneurial outcome (Urban & Kujinga, 2017). Based on the preceding discussion, the following hypothesis is formulated.

H₂: There is a positive relationship between the normative institutional environment and entrepreneurial intentions.

2.3 Cognitive Institutions and Entrepreneurial Intentions

The cognitive institutional environment consists of situations where individuals can understand business activities by interpreting the shared knowledge available in a society (Kostova & Roth, 2002). Starting a new business includes identifying suitable opportunities, screening out the sources of resources such as human, financial, and physical, and integrating resources and opportunities for producing goods or services to earn profits. The level of difficulty and ease of these activities is not similar but varies depending on the nature and characteristics of the economic system. In some countries, the knowledge necessary to start and manage a business is quickly and easily accessible, while in other countries, people face difficulties in acquiring and understanding such knowledge (Manolova et al., 2008; Virgill, 2008). In countries where the knowledge and competencies required for launching a new venture are structured and codified, such situations are conducive to entrepreneurship (Urbano & Alvarez, 2014). Individuals may display a stronger propensity to start a new venture if they have the necessary competencies (Arenius & Minniti, 2005; Davidsson & Honig, 2003). A congenial cognitive environment can be created by making start-ups more accessible and information on market demand, opportunities, and recourses accessible and comprehensible, which in turn is expected to be helpful for the decision to set up a new venture in the future (Estrin et al., 2013). So, in light of the above discussion, the following hypothesis is stated.

H₃: There is a positive relationship between the cognitive institutional environment and the entrepreneurial intentions of individuals.

2.4 Alertness and Entrepreneurial Intentions

Individuals must be capable of identifying a suitable business opportunity for a new venture and be able to notice a chance that has been ignored by other people (Kaish & Gilad, 1991). This ability, known as entrepreneurial alertness, creates a state of mind that makes individuals aware of their surroundings to receive the clues needed to generate new ideas. Alertness is a propensity to be open to available opportunities (Kirzner, 1997). Ardichvili, Cardozo, and Ray (2003) argue that entrepreneurial alertness contributes to recognizing new opportunities. Therefore, individuals with the attributes of alertness are expected to be more successful entrepreneurs than those who lack them. The reason is that entrepreneurship starts with opportunities, and individuals can recognize them when having "eyes and ears open" (Kirzner, 1979, p. 7). As alertness facilitates identifying opportunities, individuals with such propensities will be more likely to exploit these opportunities and set up a business. In similar words, when "alerted" individuals receive support from regulative,

normative, and cognitive institutions, the situation will be more favourable for them to explore business opportunities and start business ventures. With this pattern in mind, it is hypothesized that:

H₄: Alertness moderates the relationship between the (a) regulative, (b) normative and (c) cognitive institutional environments and entrepreneurial intentions positively.

2.5 Self-Efficacy and Entrepreneurial Intentions

Entrepreneurship scholars found that entrepreneurial intentions depend on the factors associated with personal attributes and the surrounding environment (Souitaris et al., 2007; Reissová et al., 2020). Self-efficacy is deemed to be the personal factor that affects the tendency of individuals to be entrepreneurs (Carr & Sequeira, 2007; Zhao et al., 2005; Miao et al., 2017). It is the confidence held by an individual to have the skills and competencies to manage a task effectively which is the precondition of choosing types of tasks and performance (Zhao et al., 2005). Starting a new venture always involves a level of uncertainty and risk that entrepreneurs must handle. This is why someone, who does not believe in his or her abilities, cannot be an entrepreneur. Scholars have already studied the impact of self-efficacy on entrepreneurial intentions (Douglas, 2013; Krueger et al., 2000; Fitzsimmons & Douglas, 2011). When confident individuals receive support from the regulative, normative, and cognitive institutional environment, they are even more likely to display greater interest in pursuing entrepreneurship. Based on this discussion following hypotheses are developed.

H₅: Self-efficacy moderates the relationship between the (a) regulative, (b) normative, and (c) cognitive environments and entrepreneurial intentions positively.

3. METHODOLOGY

3.1 Study Context

This study was conducted in Bangladesh, one of South Asia's most populous and lower-middle-income countries with 163 million people. This country has achieved significant progress in reducing poverty in recent years, but Bangladesh needs to generate more jobs to tackle the problems arising from youth unemployment (World Bank, 2019). According to the World Economic Forum (2017), Bangladesh improved its institutions, infrastructure, and macroeconomic environment scores but unfortunately, its position decreased in the Ease of Doing Business Ranking in 2018.

3.2 Research Sample and Data Collection Procedure

In the entrepreneurship literature, considering students as samples (Şahin et al., 2019; Pfeifer et al., 2014; Bonesso et al. 2018; Fayolle et al., 2006) for investigating entrepreneurial intentions is common. The nature of the study makes students appropriate for data collection as they tend to choose professions after completing their education. Reynolds et al. (2002) identify that university graduates show the highest propensity for starting up a firm. Our study also utilizes a research sample of students studying at public and private universities.

Like any other country, Bangladesh needs higher education institutions to produce creative and innovative mechanisms through continuous research to turn the population into a skilled and competent workforce for future progress (Rehnuma, 2020). The government committed to

establishing a public university in each district to increase the country's number of higher education institutions (HEIs). In addition to public universities, there are many private universities in Bangladesh, and according to the University Grant Commission (UGC), the number of public universities is 54 public and the private universities is 112. The total number of students, including public and private universities, was more than forty-six hundred thousand in 2020 (University Grant Commission, 2020).

Universities are in each division of this country. We selected six public and eight private universities, considering their geographical locations to cover our study's respondents from the entire country (see Appendix 1). The first public university was established before the independence of the country back in 1921. Public universities offer a wide range of study programs in sciences, commerce, arts, humanities, engineering and technology, and law disciplines (Monem & Baniamin, 2010). On the other hand, private university is a relatively new phenomenon introduced in 1992. They are rather small and offer mostly job-oriented courses in limited subjects (Alam et al., 2007; Mahboob, 2009). Considering this, the authors decided to include more respondents from public universities than from private universities. Furthermore, the capital city of Bangladesh is in the Dhaka division, where major public and private universities are located (Ashraf, 2019).

The data collection procedure included the following steps. Initially, by email, we contacted the faculty members of business-related departments, such as Business Administration, Management, Finance, Accounting, and Marketing of selected universities, introduced them to the expected research outline, and sought their data collection assistance. We were able to convince some of the faculty members who agreed to cooperate with us in surveying their universities. Based on their consent, we sent hard copies of the questionnaires and requested them to interview students using the delivered questionnaires. They were free to include students from any background, but they surveyed most students from their study programs. Therefore, respondents were predominantly from business-related programs (76 %), and the rest from non-business. Priority was given to the students who were almost at the end of their studies, with the expectation to track their future career transitions. Therefore, the sample includes primarily last year's bachelor- and master-level students. A total of 1,000 students were surveyed at the participating universities. However, only 777 questionnaires were found free from missing values after the initial screening. Then, three-step procedures were applied to detect outliers from the multivariate data, as Hair et al. (2006) suggested. At first, the Mahalanobis distance was calculated and subsequently squared. The D2 was divided by degrees of freedom, and observations greater than four were removed as they were identified as outliers, resulting in a final sample of 737.

3.3 Common Method Bias

Exploratory factor analysis was applied to identify the associations among the variables used in a study (Hair et al., 2006). Common method bias is problematic if a factor is accountable for most covariance (Podsakoff et al., 2003). The exploratory factor analysis revealed that one factor explains 20.65 % of the variance, which is lower than 50 percent. Furthermore, the analysis did not identify any factor that exceeds the stipulated limit; thus, the sample is free from the common method bias problem.

3.4 Measures

Originally, a questionnaire was developed in English and then translated the original questionnaire into Bangla, the mother tongue of the study context (e.g., Dickson et al., 2006). This approach was used to ensure accuracy while improving comprehensibility.

3.4.1 Dependent Variable

In this study, the dependent variable represents entrepreneurial intentions and has been measured through a Likert-type scale. Six items developed by Linan & Chen (2009) with responses ranging from 1 ("strongly disagree") to 5 ("strongly agree") were used to measure intentions.

3.4.2 Independent Variables

The institutional environment is the independent variable and consists of formal rules and policies, norms, values, and culture. Items developed by Busenitz et al. (2000) for measuring the components of institutions were used. They developed fourteen items (regulative: five; normative: five; and cultural cognitive: four) that are modified according to the model of entrepreneurial intentions. The responses range from 1 ("strongly disagree") to 5 ("strongly agree").

3.4.3 Moderating Variables

Alertness and self-efficacy are used as moderators for the study. The items used for measuring self-efficacy were adapted from Chen et al. (2001). Besides, entrepreneurial alertness was measured using the items suggested by Tang et al. (2012). All items were rated using a five-point Likert scale ranging from 1("strongly disagree") to 5 ("strongly agree").

3.4.4 Control Variables

Several control variables acknowledged in previous studies, such as the age of respondents (Kautonen et al., 2011; Lévesque & Minniti, 2006; Nowiński et al., 2019), gender (Wilson et al., 2007; Haus et al. 2013; Reissová et al., 2020), previous experiences in business (Kolvereid, 1996; Carr & Sequeira, 2007; Israr & Saleem, 2018) and income of parents (Bhandari, 2006; Laspita et al., 2012). We controlled for the respondent age, considering that it affects the decisions of individuals in choosing a career, as suggested by Lee et al. (2011). The previous research identified entrepreneurial intentions to be determined by gender (Crant, 1996; Nowiński et al., 2019). Furthermore, literature shows that females are less inclined to pursue entrepreneurship as a career pathway (Lee et al., 2011; Simoe et al., 2016). In this consideration, we controlled the effect of gender. Our respondents are students of business and non-business programs. Several studies (Gerba, 2012; Nowiński et al., 2019) document that students of business-related programs, especially those studying entrepreneurship programmes, have higher entrepreneurial intentions and are more likely to start a business. Therefore, we consider the focus of the study program as an essential control variable.

Past exposure to business is also controlled, if such exposure could affect perceptions, either negatively or positively, depending on the experience of the respondent. Entrepreneurship literature shows that people are encouraged to start entrepreneurial ventures when they accumulated previous experiences (Shane, 2000), but those who had a negative experience might have lower entrepreneurial intentions (Zapkau et al. 2015). Individuals need financial support to initiate a new

venture, as this is comparatively easier for an individual from a well-off family. One could argue that an individual born and raised in an affluent family is likely to have a greater propensity to start his or her venture because of easy access to financial resources and the chance to learn from the parent's experience (Lindquist et al., 2015). Again, being a business family member, an individual may be more aware of issues associated with starting and running a business. Hence, one can argue that an individual born and raised in a business family may be more interested in entrepreneurship. In our study, we control for the respondents' father occupation and income. Bangladesh's society is characterized by male domination. Females are prevented from being involved in market transactions and income-generation activities (Mair et al., 2012); thus, the father's occupation and income are considered.

3.4.5 Goodness of Fit Statistics

Confirmatory Factor Analysis (CFA) is applied to confirm and validate variables used in the model. The root means square residual (RMR), the goodness of fit index (GFI), and adjusted GFI are documented as 0.044, 0.939, and 0.921, respectively, and these are adequate indicators of a good model (Byrne, 2010). A normed fit index (NFI) and comparative fit index (CFI) representative of a well-fitted model should have values close to 0.95 (Hu and Bentler 1990). The model shows that the values of NFI and CFI are 0.91 and 0.94. In addition, the Tucker-Lewis Index and root mean square error approximations (RMSEA) reported in the model are 0.929 and 0.048, respectively. Both indices are within the accepted values for a good fit model (Byrne, 2010).

Table 1: Reliability and Convergent Validity

<i>Variables</i>	<i>Loadings</i>	<i>Cronbach Alpha(α)</i>	<i>Average Variance Explained (AVE)</i>	<i>Composite Reliability (CR)</i>
Entrepreneurial Intentions (Adapted from Liñán and Chen, 2009)		.887	0.621	0.891
Determined to start a business in future	0.748			
Organized thinking for a new business	0.787			
Try for a new venture	0.81			
Intention to be an entrepreneur	0.835			
Ready to be an entrepreneur	0.756			
Regulative Institutional Environment (Adapted from Busenitz, Gomez, and Spencer, 2000)		.797	0.508	0.805
Government support sponsors organizations who help entrepreneurs	0.656			
Local and national administrations support entrepreneurs	0.723			
Government assists even when failing in business for the first time	0.718			

Table 1 (Contd.)

<i>Variables</i>	<i>Loadings</i>	<i>Cronbach Alpha(α)</i>	<i>Average Variance Explained (AVE)</i>	<i>Composite Reliability (CR)</i>
Government assists starting own business	0.75			
Cognitive Institutional Environment (Adapted from Busenitz, Gomez, and Spencer, 2000)		.798	0.593	0.811
Know how to legally protect a business	0.634			
Know how to deal with risks	0.815			
Have information on how to start a business	0.844			
Normative Institutional Environment (Adapted from Busenitz, Gomez and Spencer, 2000)		.657	0.399	0.665
Creative business is taken importantly	0.614			
Entrepreneurs are admired	0.639			
Innovative thinking is considered the route of success	0.641			
Alertness (Adapted from Tang, Kacmar, and Busenitz, 2012)		.734	0.517	0.761
Participation in a seminar on how to start a business	0.603			
Regularly read newspaper sections dedicated to business and commerce.	0.77			
Regularly read business-related publications.	0.772			
Self-Efficacy (Adapted from Chen, Gully, and Eden, 2001)		.667	0.352	0.685
When I work, I strive to achieve the best	0.592			
Always trust on own competencies	0.579			
Intend to be self-reliant	0.592			
Perform well when things are tough	0.609			

3.4.6 Validity and Reliability

Factor loading, Cronbach alpha (α), an indicator of internal consistency, average variance explained (AVE), and composite reliability (CR) as measures of the reliability and validity of constructs were used. The reliability was computed to confirm that the items together were appropriate to measure the desired constructs all the time (Gefen et al., 2000). Cronbach's alpha is a commonly used and

popular measure of internal consistency reliability. A value of 0.70 or higher is considered acceptable reliability (Nunnally, 1978). Table 1 shows that Cronbach's alpha values were well above 0.70, except for the normative institutional environment and self-efficacy constructs, with values of 0.657 and 0.667, respectively. These, however, are closer to 0.70.

Convergent validity is the extent to which the items converge or share a high proportion of common variance (Hair et al., 2006). Factor loading, average variance explained (AVE), and construct reliability for confirming the convergent validity of constructs were applied. The most accepted rule is that the standardized loading estimate should be 0.5 or higher and, ideally, 0.7 or higher (Hair et al. 2006). The test reveals that all the loadings of 22 items are greater than either 0.5 or 0.7. The AVE of 0.50 or greater (Fornell & Larcker, 1981) represents that the construct is responsible for explaining more variance with its indicators than with the error variance. Table 1 shows that the AVEs have sufficient scores, except the normative environment and self-efficacy scores, which were 0.399 and 0.352, respectively. Reliability estimates of 0.7 or higher indicate good reliability, but those between 0.6 and 0.7 may be acceptable (Hair et al., 2006). So, from the point of view of AVE, this reveals that all constructs are within the allowable range.

The Average Variance Explained (AVE) of each construct was calculated, and the results were compared with the correlations among constructs to assess discriminant validity (Netemeyer et al., 2003; Barclay et al., 1995). Table 2 contains the diagonal components, which are the square root of the AVE, and the off-diagonal elements, which are the correlations among constructs. The diagonal items must be greater than the corresponding row or column elements to establish the discriminant validity. Table 2 shows that each diagonal construct is greater than the off-diagonal elements; thus, the discriminant validity has been established.

Table 2: Discriminant Validity (N=737)

Constructs	Regulative Institutional Environment	Entrepreneurial Intentions	Cognitive Institutional Environment	Self-Efficacy	Alertness	Normative Institutional Environment
Regulative Institutional Environment	0.713					
Entrepreneurial Intentions	0.029	0.788				
Cognitive Institutional Environment	0.206	0.342	0.770			
Self-Efficacy	0.052	0.429	0.257	0.593		
Alertness	0.186	0.393	0.328	0.168	0.719	
Normative Institutional Environment	0.454	0.165	0.198	0.279	0.198	0.631

4. ANALYSIS

4.1 Descriptive Statistics and Bivariate Correlations

Descriptive statistics and correlations for all variables are provided in Table 3. The average age of respondents is 22.5 years. This study reports low levels of correlation between variables. The entrepreneurial intentions variable has correlations with regulative, normative, and cognitive components of the institutional environment, and they are statistically significant ($p < .05$) except for the regulative institutional environment.

Table 3: Descriptive Statistics (N=737, bivariate relation coefficients reported in columns)

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
Gender	1.36	0.48											
Age	22.84	1.98	-.101***										
Nature of Education	1.25	0.43	.076*	-.062									
Father Occupation	1.81	.82	-.076*	.104**	.102**								
Father Income	4.44	0.38	.000	-.013	-.045	-.082*							
Previous Exposure	1.45	0.50	.187***	-.066	.167**	.109*	-						
Entrepreneurial Intentions	3.88	0.89	-.154**	-.022	-.210**	-.082*	.056	-.251***					
Regulative Environment	2.84	0.85	.072*	-.012	-.020	-.006	-.009	-.044	.013				
Cognitive Environment	3.26	0.89	-.167***	.037	-.240**	-.052	-	-.325***	.283**	.191**			
Normative Environment	3.38	0.93	.036	-.096**	-.083*	-.045	-	.006	.119**	.328**	.144***		
Alertness	2.73	0.92	-.085*	.061	-.158**	-.003	.023	-.202***	.342**	.163**	.290***	.139***	
Self-Efficacy	4.37	0.57	.032	-.077**	-.084*	-.078*	.023	-.032	.340**	.008	.193***	.163***	.117**

Notes: statistical significance reporting: *** $p < 0.001$, ** $p < 0.01$, * $p < .0$

4.2 Regression Estimation Procedure

Five multivariate regression models were estimated using the ordinary least square (OLS) method following the hierarchical regression empirical approach. Besides, several tests were conducted to ensure data quality and check all OLS regression assumptions (e.g., Hair et al., 2006). At first, outliers are detected, pursuing the methods Hair et al. (2006) recommended for multivariate data. Then, the Ramsey RESET test was applied to see whether the model had any omitted variables

(Parker, 2006). Ramsey RESET results¹ show that models are correctly specified (except for Model 1). Breusch-Pagan test results² show that data do not predominantly suffer from heteroskedasticity (except for Model 1). The Newey-West procedure is applied to ensure consistency in standard errors (Smith & McAleer, 1994). All the individual variance inflation factors (VIF) are below 1.50 and have a critical value of 10. It is concluded that the data are not distorted by multicollinearity (Neter et al., 1985). According to Aiken & West (1991), each independent variable was mean-centered before interaction.

Table 4 documents the results of the hierarchical regression model estimation. In Model 1, the included control variables explain 11.5 percent of the variance in entrepreneurial intentions (Model 1: $R^2=0.115$, $p<0.001$). We report the results of Model 1 in Table, although it has several econometric problems, to demonstrate the process of hierarchical regression estimation transparently. However, we do not use it to empirically check the validity of our hypotheses. In the second step, along with control variables, predictor variables are entered to test the hypotheses (Model 2: $R^2=0.153$, $p<0.001$). In step 3, moderators, along with predictors and control variables, are included in the model (Model 3: $R^2=0.271$, $p<0.001$). In the fourth step, a set of two-way interaction terms along with control variables, predictors, and moderators is added to test the hypothesis (Model 4: $R^2=0.272$, $p<0.001$). Finally, control variables, predictors, moderators, and both sets of two-way interactions are included in the final model (Model 5: $R^2=0.274$, $p<0.001$).

Table 4: Results of Hierarchical Regression Models for Entrepreneurial Intentions^a

<i>Variable</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>
<i>Control Variables</i>					
Gender	-.235*** (.067)	-.200** (.066)	-.210** (.551)	-.214** (.062)	-.220 (.062)
Age	-.026 (.016)	-.022 (.016)	-.020 (.062)	-.020 (.015)	-.020 (.015)
Nature of Education	-.312*** (.074)	-.224** (.075)	-.172* (.015)	-.174* (.070)	-.173 (.070)
Father Occupation	-.051 (.041)	-.043 (.040)	-.041 (.069)	-.041 (.037)	-.044 (.038)
Father Income	.077 (.092)	.096 (.090)	.057 (.037)	.061 (.084)	.058 (.084)
Previous Exposure	-.379*** (.065)	-.297*** (.066)	-.210*** (.084)	-.259*** (.062)	-.256 (.062)
<i>Main Variables</i>					
Regulative Institutional Environment		-.043 (.039)	-.045 (.036)	-.041 (.036)	-.040 (.037)
Normative Institutional Environment		.182** (.038)	.082 (.037)	.082 (.037)	.084 (.038)
Cognitive Institutional Environment		.094*** (.035)	.039* (.033)	.039* (.033)	.036* (.033)
<i>Moderators</i>					
Alertness			.236***	.236***	.233***

¹Ramsey RESET results: Model 1 suffers from the omitted variable problem $F(3,727) = 3.27$, $p = .021$. Model 2: $F(3,722) = 0.96$, $p = 0.409$; Model 3: $F(3, 719) = 1.67$, $p = 0.172$; Model 4: $F(3,716) = 0.96$, $p = 0.41$; Model 5: $F(3,716) = 1.61$, $p = 0.185$.

²Results of Breusch-Pagan tests: Model 1 has problems of heteroscedasticity ($\chi^2=4.08$, $p=0.043$); Model 2: $\chi^2=1.57$, $p=0.21$; Model 3: $\chi^2=165$, $p=0.198$; Model 4: $\chi^2=1.28$, $p=0.26$; Model 5: $\chi^2=1.37$, $p=0.241$).

Table 4 (Contd.)

<i>Variable</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>
			(.033)	(.033)	(.034)
Self-Efficacy			.049*** (.006)	.049*** (.006)	.048*** (.007)
<i>Interaction terms</i>					
Regulative Institutional Environment × Alertness				-.044 (.040)	-.039 (.042)
Normative Institutional Environment × Alertness				.014 (.036)	.001 (.038)
Cognitive Institutional Environment × Alertness				-.009 (.034)	-.005 (.036)
Regulative Institutional Environment × Self-Efficacy					-.004 (.010)
Normative Institutional Environment × Self-Efficacy					.011 (.009)
Cognitive Institutional Environment × Self-Efficacy					-.003 (.009)
F - Ratio	15.858	14.630	24.532	22.520	20.940
R ²	.115	.153	.271	.272	.274
Adjusted R ²	.108	.143	.260	.260	.260
R ² Change	.115	.038	.118	.001	.002
Observations	737	737	737	737	737

Notes: statistical significance reporting: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; Standard errors are reported in parentheses; ^aUnstandardized regression coefficients are reported.

4.3 Results of Hypotheses Testing

4.3.1 Results for Hypothesis 1

The first hypothesis focused on the association between the regulative institutional environment and entrepreneurial intentions. It was assumed that the regulative institutional environment positively influences entrepreneurial intentions. However, when examined with other variables in multivariate regression models, the regulative institutional environment variable has not been statistically significant in any estimated models. Therefore, the sample used for this study cannot support this hypothesis.

4.3.2 Results for Hypothesis 2

The second hypothesis has been formulated to explore how the normative institutional environment relates to entrepreneurial intentions. It was hypothesized that the normative institutional environment positively affects entrepreneurial intentions. The obtained results are not fully statistically conclusive. While in Model 2, the variable was statistically significant, the statistical significance disappeared in the remaining specifications (i.e., in Models 3 to 5). Therefore, we do not dare to support the hypothesis in our sample.

4.3.3 Results for Hypothesis 3

The third hypothesis aimed to explore the influence of a cognitive institutional environment in shaping entrepreneurial intentions. As we observe the statistical significance of the variable in Models 2 to 5, the variable is statistically significant and positively influences entrepreneurial intentions. Therefore, we support the hypothesis in our sample of students.

4.3.4 Results for Hypothesis 4 (a, b, c)

The fourth hypothesis intended to explore the role of entrepreneurial alertness. It was hypothesized that alertness moderates the relationships between the regulative, cognitive, and normative institutional environments and entrepreneurial intentions. Unfortunately, the obtained coefficients in Model 4 were not statistically significant; thus, we cannot support the stated hypothesis for our research sample.

4.3.5 Results for Hypothesis 5 (a, b, c)

The fifth hypothesis aimed to test the interaction of regulative, cognitive, and normative institutional environments with self-efficacy. It was hypothesized that self-efficacy moderates the relationships between the regulative, cognitive, and normative institutional environments and entrepreneurial intentions. However, when examined with other variables in multivariate regression models with entrepreneurial intentions as the outcome variable, it was revealed that self-efficacy does not affect the hypothesized relations (Model 5). Thus, this hypothesis cannot be empirically supported.

5. DISCUSSION

We examined the impact of the institutional environment on an individual's attitudes towards entrepreneurship. We aimed to determine whether the institutional environment alone or in interaction with other variables affects entrepreneurial intentions. The results regarding regulative and normative institutions do not seem to significantly influence the entrepreneurial intentions of Bangladesh students participating in our study. This may be associated with the long-term dysfunction of the local entrepreneurship ecosystem. The public policies promoting entrepreneurship and self-employment and the regulatory actions do not seem to be working properly or are absent in Bangladesh, and thus, they fail to inspire others to start their businesses, as noted by several scholars (Khanna & Palepu, 1997; Chowdhury, 2007; Mair & Marti, 2009; Hadjimanolis, 2016). The obtained results should be thus used as another statistical evidence calling policymakers to adjust the local business environment and entrepreneurship ecosystem to support better the formation of entrepreneurial intentions and new entrepreneurial activity.

On the other hand, our study confirms a positive and statistically significant association between the cognitive institutional environment and entrepreneurial intentions. Spreading knowledge about doing business and setting up an enterprise seems to be meaningful ways to foster the entrepreneurial intentions of Bangladesh students. Our findings suggest that policymakers and business-supporting stakeholders should emphasize establishing supportive cognitive institutional arrangements, such as projects spreading information about business start-up procedures and issues related to the management of their business activity. An environment with supportive arrangements indicates that individuals are aware of market conditions, and available opportunities for starting a business. In addition, they know about handling risks and accessibility of information related to trade and commerce (Manolova et al., 2008; Estrin et al., 2013). In Bangladesh, universities offer

business degrees such as Bachelor of Business Administration (BBA) or Master of Business Administration (MBA). Still, the programs should also, to a more considerable extent, include practical entrepreneurial training so that students have a chance to learn how to start and manage a business (Chowdhury, 2007; Haolader, 2015).

Furthermore, our study does not provide statistically significant interactions between alertness, self-efficacy, regulative, normative, and cognitive institutional environments on entrepreneurial intentions. However, we support the role of established determinants of entrepreneurial intentions such as entrepreneurial alertness, and self-efficacy. Bangladesh students form their entrepreneurial intentions mainly based on their characteristics and traits (Sarasvathay & Venkataraman, 2010; Tang et al., 2012; Yukongdi & Lopa, 2017).

6. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Several limitations create a more expansive space for additional research. First, data on dependent and independent variables were collected through the same survey, which may have created a common method bias. We addressed the problem by implementing Harman's one-factor test and confirmatory factor analysis but concluding that the issue has been addressed completely is difficult. Rather, there may remain a threat, although minor (Stam & Elfring, 2008). The results should be interpreted and used, taking this into account. Second, our study is based on a cross-sectional sample that failed to capture the dynamic interplay between institutional perceptions and entrepreneurial intentions. Future research should address this using a longitudinal sample to derive more substantial and causal implications (Zhang & Shaw, 2012). Third, although we used validated scales from the previous literature, there is still a threat resulting from the fact that these are data obtained from the survey. Some constructs like self-efficacy and normative environment have an average variance explained (AVE) and composite reliability (CR) slightly lower than the cut-off value, which may additionally limit the provided findings. Finally, we need to acknowledge the limitations resulting from our sample. Future research should include a more comprehensive sample, including students from other (non-business) study programs and larger-sized samples. This would help the scholarly community validate which institutional variables and their interactions with individual characteristics mainly influence entrepreneurial intentions.

7. CONCLUDING REMARKS

Entrepreneurial intentions relate to the eagerness to develop and own a new venture one day (Zang & Cain, 2016), which can foster innovation, create new jobs, and contribute to the growth and development of the economy and society (Galindo & Méndez, 2014). This study investigated the determinants of entrepreneurial intentions by applying institutional theory, consisting of regulative, normative, and cognitive dimensions (Scott, 2013). Although entrepreneurship studies using the institutional theory approach have grown over the past few years, most focus on entrepreneurship in developed countries (Su et al., 2017; Eijdenberg et al., 2016). Thus, our study contributes to the replication of earlier research on entrepreneurial intentions (Davidsson, 2015), but it can also be considered unique from the regional point of view. Furthermore, we document that antecedents of entrepreneurial intentions are still not fully exploited research topic by providing research suggestions within the multilevel dimension of the phenomenon. Every new study needs to fit into a context that may solidify the theory of entrepreneurial intentions. Despite the identified limitations, the study provides value for the regional scholarly community and policymakers aiming to stimulate entrepreneurial activity in Bangladesh as an example of a developing country with an underdeveloped business environment.

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Appendix 1: Selected universities for data collection

SI #	University	Nature	Division
1	University of Rajshahi	Public	Rajshahi
2	Varendra University	Private	Rajshahi
3	Jahangir Nagar University	Public	Dhaka
4	Bangladesh University	Private	Dhaka
5	Hamdard University	Private	Dhaka
6	Bangladesh University of Business and Technology	Private	Dhaka
7	Begum Rokeya University	Public	Rangpur
8	Khulna University	Public	Khulna
9	North Western University	Private	Khulna
10	Northern University	Private	Khulna
11	Jatiya Kobi Kazi Nazrul Islam University	Public	Mymensingh
12	Leading University	Private	Sylhet
13	Port City International University	Private	Chittagong
14	Barisal University	Public	Barisal

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THE CAUSAL RELATIONSHIP BETWEEN OIL PRICE AND INFLATION IN BANGLADESH: AN EMPIRICAL ANALYSIS

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ABSTRACT

Bangladesh is one of the fastest growing developing economies in the South Asian region with very little fossil fuel endowment. As a result, the country typically relies on imported energy sources. Existing media reports point out an increase in global energy prices in recent years. An increase in global oil price simultaneously increases the rate of inflation in the oil importing countries as well. Hence, the aim of this paper is to empirically analyze the short-run and long-run causal relationship between oil price in the international market and domestic inflation in Bangladesh. Using annual data ranging from 1980 to 2021, the paper conducts a Johansen's cointegration test to identify the variables' cointegrating relationship. Moreover, Granger Causality and VECM causality tests confirm a unidirectional causality runs from oil price in the international market to domestic inflation in Bangladesh, both in the short run and in the long run.

Keywords: Inflation, Oil price, Bangladesh, Granger Causality, VECM Causality

1. INTRODUCTION

Energy is considered to be a “universal” production input that is essential for driving industrial growth and economic productivity. Energy availability plays a fundamental role in facilitating urbanization, industrialization and job creation that, eventually, leads to economic development. Without steady energy supply, it would be impossible for enterprises and factories to keep functioning and cities will not be able to provide jobs for its dwellers. Due to technological advancement and recent innovations, all economic sectors i.e.; industry, agriculture and services are also heavily dependent on automated equipment and energy driven machineries. Therefore, it is of paramount importance that energy moves along freely throughout the country to ensure economic efficiency and sustainable development.

Bangladesh has emerged as one of the fastest growing developing countries in the South Asian region in the past few decades. At the same time, its demand for energy in both its production and residential sectors has registered unprecedented growth. On average, total energy consumption has increased by 4.5% annually since 2010 (World Bank, 2022). However, Bangladesh has very limited fossil fuel-based energy endowment in forms of natural gas and coal. As a result, the country needs to rely heavily on imported energy. According to Bangladesh Petroleum Corporation (BPC), Bangladesh imports approximately 6.5 million tons of crude and refined oil annually that fulfills 90% of country's total fossil fuel based primary energy requirements. The remaining 10% of the primary energy requirements are fulfilled by natural gas and coal that are mostly domestically extracted or imported from neighboring countries.

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Therefore, the Bangladesh economy is particularly susceptible to international energy price shocks, especially oil price shocks in the international market*. Oil price shocks can affect a number of macroeconomic variables such as exchange rate, inflation, food security, the terms of trade, stock market and eventually, the economic growth. (Amin & Marsiliani 2015). This paper aims to investigate the relationship between the global oil price shocks and domestic inflation as price hikes are a challenging phenomenon to deal with, especially in a developing economy like Bangladesh. Oil price can affect domestic inflation directly through the demand side which is also known as “imported inflation”. Petroleum products are often used as intermediate inputs in transport and residential services and in the agricultural sector. Therefore, with rapid economic growth, the country’s demand for petroleum and oil products also increases and as Bangladesh is predominantly an oil importing country, it simply has to import oil at a higher price giving rise to domestic inflation via energy commodities in the consumption basket (Zakaria et al. 2021).

A rise in the price of imported oil gives rise to “cost-push” inflation in the domestic market. As cost of production for both industrial and agricultural goods rises due an oil price hike, firms cannot sustain profit margins by charging the same price. Apart from core production cost, oil prices also have cost-multiplier effects on the economy-wide supply-chain through forward and backward linkages in the production process. As prices of intermediate and final goods start to rise in the market and real income falls, labors may also start to demand an increase in wages leading to further increase in cost of production and subsequent inflation. Even though the flow-on effects of a price hike of oil in the international market on domestic inflation seem easy to explain, in reality oil prices are highly subsidized by the government in a developing country. As the size of subsidy grows with oil price hikes, government’s other expenditure pursuits are compromised which eventually hampers overall economic performance of the country. It is widely reported in existing literature that an increase in oil price is responsible for curbing economic growth, boosting inflation and impeding productive activity in most economic sectors.

A few studies have empirically investigated the macroeconomic effects of global oil price hikes in the context of Bangladesh. However, it is an issue of immense importance; and according to World Bank (2019), Bangladesh’s imported energy dependency will escalate to 90% by 2030. Zakaria et al. (2021) analyzed the relation between the global oil price and domestic inflation using an Impulse Response Function and they revealed a one standard deviation shock in global oil price increases inflation rate in Bangladesh by 7.72% after 24 months. Adebayo (2020), Husaini et al. (2019) and Sultan et al. (2020) have conducted cointegration and causality analysis between oil price and inflation for Nigeria, Malaysia and India respectively.

However, to the best of our knowledge, there is no extensive empirical study that investigated the connection between oil price and inflation distinguished by short run and long run. The analysis in this paper does that by using a Vector Error Correction Model (VECM) for Bangladesh. This paper explores the complex causal connection between oil price and domestic inflation in Bangladesh using annual data for years 1981-2021. Bangladesh is a rapidly developing country that recently transitioned from a low income to lower middle-income country. It faces a lot of economic challenges to maintain its buoyant economic growth given the current eco-political reality. Proper energy related policies are therefore extremely vital for the country’s economic management.

*the global market, natural gas prices are closely linked to oil prices. Hence, this paper specifically focuses on oil price.

The rest of the paper is organized as follows: Section 2 presents a detailed review of existing literature; Section 3 describes the data and methodology adopted for econometric estimations; Section 4 explains the results derived from econometric analysis; and, lastly, the paper concludes in Section 5.

2. LITERATURE REVIEW

The relationship between international oil price and domestic inflation has been extensively researched and a host of papers have conducted detailed empirical analysis on this topic, using country specific time-series data, regional cross-section data and panel data. Kilian (2014) emphasized the importance of transmission channel through which oil price affects inflation and other macroeconomic attributes of an economy. The “pass-through” mechanism can be mobilized via supply side or demand side and may demonstrate a steady dominant trend as well as seasonal fluctuations. In certain cases, there will be drastic changes in forms of structural break caused by policy interventions, global turmoil or natural disasters etc.

The literature on the nexus between oil price and inflation can be broadly categorized in two groups. The first group includes handful of papers that reported the effect of oil price on inflation to be negligent and transitory. Hooker (2002) analyzed annual data of global oil price and inflation for year 1960 -2000 and found that oil price had positive impact on inflation only during 1960-1980. Since 1980 onwards till year 2000, he did not find any inflationary impact of oil price shocks. Chen and Wen (2011) analyzed data for year 1985-2011 and reported oil price rise is not responsible for underlying trend inflation and only have temporary effect in CPI inflation. Salisu et al. (2017) reported oil price has positive and significant impact on domestic inflation in both net oil exporting and net oil importing countries in the long run. However, the effect of oil price hike on inflation is more severe in net oil importing countries. They also reported ambiguous results in short run analysis.

Nonetheless, majority of the paper have reported strong inflationary effect of oil price shock. For example, Sek et al. (2015) have employed Pooled Mean Group Auto Regressive Distributive Lag (PMG-ARDL) model to analyze the effect of oil price on 10 high oil dependent group of countries and 11 low oil dependent group of countries. Analyzing annual panel data of years 1980-2010, they revealed oil price affect domestic inflation via direct channel in low oil dependency countries. On the other hand, in high oil dependent countries, oil price affects domestic inflation indirectly via increased real exchanged rate and exporters’ production cost. The magnitude of impact of oil price is almost three times in high oil dependent countries than of low oil dependent countries. Choi et al. (2018) analyzed panel data of 72 advanced and developing countries for years 1970-2015. They applied Impulse Response Function (IRF) methodology and reported 0.4% increase in domestic inflation due to 10% increase in oil price in the international market.

Chou and Tseng (2011) reported positive and significant pass- through effect of oil price on Consumer Price Index (CPI) in Taiwan in the long run but the effect was insignificant in the short run. Taghizadeh-Hesary and Yoshino (2015) analyzed monthly data of China, Japan and United State of America for year 2008-2013 using a Structural Vector Auto Regressive (SVAR) model including structural break. Their findings suggest oil price is a positive and significant determinant of inflation that impedes economic growth in the long-run. Zakaria et al. (2021) empirically investigated the relation between global oil price and domestic inflation in South Asia using monthly panel data for years 1980-2018. Using a Variance Decomposition Analysis, they revealed a global oil price shock increases inflation rate in the long run.

A number of country specific literatures also exist in this field of research. Adebayo (2020) have applied Wavelet Coherence technique on monthly data of Nigeria for time period January 2007 to March 2020 and found unidirectional causality running from oil price to domestic inflation. Sultan et al. (2020) analyzed time series data of India for year 1970-2017. Using a Johansen cointegration test, they found long run association between global oil price and domestic inflation in India. They also reported one way causality running between oil price and inflation using Granger causality test. Husaini et al. (2019) analyzed time series data of Malaysia for year 1981-2015 using ARDL regression technique. They reported oil price has a positive and significant impact on inflation and has a stronger effect on Producer Price Index (PPI) compared to Consumer Price Index (CPI).

Ahmed et al. (2018) used panel data of SAARC countries for year 1982-2014 and employing FEVD methodology, they identified 4-8% of forecast error variance in inflation in Bangladesh can be explained by oil price shocks. Zakaria et al. (2021) analyzed monthly data of four South Asian countries for year 1980-2018 and reported a global price hike leaves a permanent and asymmetric impact on inflation in South Asia using IRF analysis.

3. DATA AND METHODOLOGY

The annual data for international crude oil prices are collected from BP statistical review of World Energy for years 1980-2021. In order to measure inflation, GDP deflator data are collected from World Development Indicator, World Bank for years 1980 -2021.

3.1 Unit Root Test

Time series datasets are particularly susceptible to non-stationarity that can generate spurious correlation in empirical analysis. Therefore, first course of action is to verify the stationarity of dataset using Augmented Dickey Fuller (ADF) Unit Root test. If we find presence of Unit root in the data set, we will have to take first-difference of the data set and run the ADF test again to ensure stationarity of the dataset.

3.2 Cointegration Analysis

In the next step, we check for cointegration between our variables of interests i.e. oil price and inflation. In the presence of cointegrated association, non-stationary variables are related as such that they cannot deviate from equilibrium in the long term. Cointegration tests are conducted to identify possible linear combinations of variables which could be considered as stationary. We have chosen the Johansen cointegration test as it provides a unified framework for estimation and testing for co-integration relations in the context of Vector Autoregressive (VAR) error correction model. (Johansen, 2008)

In this context, we have to apply an Unrestricted Vector of Autocorrelation of the form:

$$\Delta x_t = \alpha + \theta_1 \Delta x_{t-1} + \theta_2 \Delta x_{t-2} + \theta_3 \Delta x_{t-3} + \dots + \theta_{k-1} \Delta x_{t-k+1} + \theta_k \Delta x_{t-k} + u_t$$

Here Δ = difference operator

$x_t = (n \times 1)$ vector of non-stationary variables at level I (0)

$u_t = (n \times 1)$ vector of random errors

θ_k = coefficients of the variables { $\theta_k = 0$: No cointegration vector

Rank of θ_k , $r = 1$: At least one cointegration vector exists

$1 > r > n$, there are multiple cointegration vectors exists}

Johansen and Juselius (1990) have developed two separate tests for identifying long run cointegration in variables. The first test is Trace test that tests the null hypothesis of at most r cointegrating vectors and the second test is Eigen value test that tests the null hypothesis of exactly r cointegrating vectors.

3.3 Causality Tests

3.3.1 Granger Causality Test

Granger (1969) elaborated the causality framework based on linear regression modeling of stochastic processes. Suppose x and y represents two time series variables. If past values of y can explain changes in present value of x , given past values of x is accounted for in the system, then we can say y granger causes x . In the presence of cointegration among variables, at least one direction of causality always exists. We will estimate the following equations:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \dots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \dots + \beta_l y_{t-l} + u_t$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \dots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \dots + \beta_l x_{t-l} + v_t$$

The Standard granger causality follows the F-test for the joint hypothesis $\beta_1 = \beta_2 = \beta_3 = \dots = \beta_l = 0$ However, Granger (1988) emphasized the importance of including error correction term in the model or else the granger-causality framework may demonstrate invalid causal linkage, especially in case non-stationary variables at level. Another advantage of including the error correction term to the model would be the ability to test for short run and long run causality. Granger causality can only account for long run causality but in an Error Correction model the lagged changes in the independent variables represent the short run causal impact while significance of the error correction term gives the information on long run causality.

3.3.2 Vector-Error-Correction Model (VECM)

While Granger causality framework can only test for long run causality among variables of interest, Vector error correction model (VECM) is a stochastic multivariate Vector Autoregressive model that can test for causal relationships in both short run and long run time frame. Under the assumption of at least one co-integrational relationship among variables, the VECM generated error correction term can capture the short-run deviations of time series variable from their long-run equilibrium path (Narayan & Smyth, 2004). Therefore, error correction models of co-integration under the tri-variate system in this study can be represented using the following equations

$$\Delta Y = \alpha + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + \sum_{j=1}^n \gamma_j \Delta X_{t-j} + \sum_{k=1}^0 \delta \Delta M^s + \sum_{l=1}^p \zeta \Delta N + \theta Z_{t-1} + \varepsilon$$

$$\Delta X = a + \sum_{i=1}^m b_i \Delta Y + \sum_{j=1}^n c_j \Delta X_{t-j} + \sum_{k=1}^0 d \Delta M^s + \sum_{l=1}^p e \Delta N + f Z_{t-1} + \xi$$

The VECM model captures the short run effects through individual coefficients of the differentiated terms. The null hypothesis of the model assumes X does not Granger causes Y. The null hypothesis is rejected if the coefficients on the lagged values of X is jointly significant. In addition, in cases where X is included in cointegrating relationship, we accept the null hypothesis if the coefficient of the lagged error-correction term is statistically significant. Changes in an independent variable may be interpreted as representing the short run causal impact while the error-correction term provides the speed of adjustment of X and Y toward their respective long run equilibrium. Thus, the VECM representation allows us to differentiate between the short- and long-run dynamic relationships. The Chi-Square test statistic is used to determine the short run causalities between pairs of variables in the model.

4. RESULT AND DISCUSSION

Time series data sets are more likely to be non-stationarity due to stochastic or deterministic trend inherent in data and can generate spurious results and problematic statistical inference if not accounted for in a proper way. We conduct an Augmented Dickey-Fuller (ADF) test to check for non-stationarity and order of integration of the variables. As unit root tests are based on skewed asymptotic distribution, presence of time trends, constants and other deterministic elements can reduce power of the test. Therefore, ADF tests are conducted including both constant and time trend. The test results are presented in Table 1 in level and first differenced form. The null hypothesis of ADF test assumes unit root is present and we accept the null hypothesis at level for both oil price and Inflation and conclude both our variables are non-stationary at level.

Table 1: Augmented Dickey-Fuller Unit Root Test

Panel 1: Level			
	ADF Statistics (Only constant)	ADF Statistics (Constant & trend)	Decision
Oil Price	-1.4298 (0.5584)	-2.3243 (0.4120)	Unit root present, Non-Stationary
Inflation	4.117 (1.00)	0.6264 (0.9993)	Unit root present, Non-Stationary

Panel 1: 1 st Difference			
	ADF Statistics (Only constant)	ADF Statistics (Constant & trend)	Decision
Oil Price	-5.8732*** (0.0000)	-5.7941*** (0.0001)	No Unit root, Stationary
Inflation	-4.3173*** (0.0014)	-5.8273*** (0.0001)	No Unit root, Stationary

p-values are reported in parenthesis. ***,** and * represents statistical significance at 1%, 5% and 10% level respectively.

Therefore, we conduct the ADF test again at 1st difference where the first difference of a time series is the series of changes from one period to the next. At first difference, for both Oil price and Inflation we can reject the hull hypothesis at 1% level of significance and conclude the variables are stationary at 1st difference. It implies statistical properties of the 1st differenced dataset will not change over time and the overall behavior of the data should remain constant.

Table 2: Johansen Test for Cointegration (Maximum Eigen value test)

	Null Hypothesis Ho	Maximum Eigen value Test Statistics	Critical value at $\alpha=5\%$	Alternate Hypothesis	Maximum Eigen value Test Statistics	Critical value at $\alpha=5\%$
Oil price and Inflation	Ho: No cointegration	25.1887*** (0.0001)	11.2248	At most one cointegration	2.5603 (0.1295)	4.1299

p-values are reported in parenthesis. ***,** and * represents statistical significance at 1%, 5% and 10% level respectively.

Table 3: Johansen Test for Cointegration (Trace test)

	Null Hypothesis Ho	Maximum Eigen value Test Statistics	Critical value at $\alpha=5\%$	Alternate Hypothesis	Maximum Eigen value Test Statistics	Critical value at $\alpha=5\%$
Oil price and Inflation	Ho: No cointegration	27.7491*** (0.0001)	12.3209	At most one cointegration	2.5603 (0.1295)	4.1299

p-values are reported in parenthesis. ***,** and * represents statistical significance at 1%, 5% and 10% level respectively.

In the next step, we conduct Cointegration test to reveal long-term correlation between oil price and inflation. Existence of cointegration implies multiple non-stationary (at level) data series are interlinked through an error-correction model. They move together in a way that their linear combination results in a stationary time series and they don't deviate from equilibrium in the long run. We imply Johansen test for cointegration and the results are presented in table 2 and 3 respectively. Both Maximum Eigen value test and Trace test reject the null hypothesis of no cointegration at 5% level of significance. Therefore, we can confirm one cointegration relationship exists between oil price and inflation in the long run.

Table 4: Oil Price and Inflation Granger Causality Test

Null Hypothesis	F-statistics	P-value	Decision
Oil price does not Granger cause Inflation	7.4821***	0.0020	Unidirectional causality runs from Oil price to inflation
Inflation does not Granger cause Oil price	0.9365	0.4016	

Table 5: Oil Price and Inflation VECM Causality Test

Short Run Causality			
Null Hypothesis	Chi-Square-Statistics	P-value	Decision
Oil Price does not cause Inflation in short run	18.18***	0.00	Unidirectional short run causality runs from Oil price to inflation
Inflation does not cause Oil Price in short run	0.95	0.32	

Long-Run Causality			
Null Hypothesis	F-Statistics	P-value	Decision
Oil Price does not cause Inflation in long run	9.53***	0.001	Unidirectional short run causality runs from Oil price to inflation
Inflation does not cause Oil Price in long run	0.48	0.61	

Notes: VECM is ran at lag 1 by following Akaike Information Criterion (AIC) criteria. The inverse roots are inside the circle, indicating stability of the VECM system of equations.

Once we confirm the long run cointegration among the variables of interest, we then run the Granger causality test. Results of Granger causality test presented in Table 4 reveals that first null hypothesis can be rejected at 1% level of significance which means oil price granger causes inflation but not vice versa as we cannot reject the second null hypothesis even at 10% level of significance. Therefore, we can conclude that a one-way causal relationship exists between oil price and inflation where oil price in the international market is found to cause domestic inflation in the long run in Bangladesh.

VECM causality test has an advantage over Granger causality as it can check for both short run and long run causal association. The results of VECM test are presented in Table 5. We find oil price causes inflation in Bangladesh in both short run and long run. However, inflation in Bangladesh seems to have no causal impact on oil price in short or long run. Our findings are consistent with results reported by Adebayo (2020), Sultan et al. (2020) and Ahmed et al. (2018). Since, Bangladesh is a solely oil import dependent country, it is only reasonable that an increase of oil price increases production cost domestically and leads to cost push inflation. Also, Bangladesh has a net trade deficit and its import cost also increases due to oil price hike which results in “imported inflation”.

Noticeably, that oil price also impacts inflation in the short run but oil price in the domestic market of Bangladesh is regulated by Bangladesh Energy Regulatory Commission (BERC). Therefore, an international oil price hike does not always immediately translate into an increase in oil price in Bangladesh. BERC often takes time to regulate its pricing policy based on government directives and suggestions by concerned stakeholders. Therefore it is understandable that an increase in oil price will have an impact on inflation in long run, However, our results show an impact on domestic inflation in short run as well because an international oil price hike can cause domestic inflation based on fear of expected inflation in near future (Istiak and Alam, 2019).

On the other hand, domestic inflation in Bangladesh has no causal impact on oil price in the international market because compared to global context, Bangladesh economy is a small open economy that is a net importer of oil. Inflation in major oil exporting countries like Saudi-Arabia, UAE and Russia can influence global oil price to some extent as the countries try to strengthen their exchange rate and global competitive edge by hiking up oil price given global political context (Choi et al. 2018; Lioudis, 2022). However, since Bangladesh is not an oil exporter or a member of OPEC, domestic inflation in Bangladesh does not have any impact on international oil prices.

5. CONCLUSIONS

The paper has examined the impact of oil price change in the international market on the domestic inflation in Bangladesh. We have used annual data for international crude oil price and the GDP deflator as measurement of inflation for years 1980-2021. After running various econometric methods, the paper confirms unidirectional causality running from oil price to domestic inflation,

which implies international oil price is one of the major reasons for inflation in Bangladesh. Our finding is robust as both Granger causality and VECM causality have generated the similar results.

The long-run causality can be explained via the “cost-push” channel and the short-run inflation can be explained through “imported inflation” and the expected inflation theory. It implies that Bangladesh Energy Regulatory Commission (BERC) needs to adopt faster and pro-active price-adjustment mechanism so that it can assist the Bangladesh Bank to maintain a targeted inflation rate, especially in the short run. In the long-run, “cost-reflective” pricing strategy can be adopted to restructure the internal oil market in Bangladesh. The government can gradually privatize the energy market or encourage public-private partnerships to make the market structure more competitive. This will also reduce administrative inefficiency and proper policy implementation. The monetary policy should be more dynamic in nature so that it can be effective in curbing inflationary pressure. Also, the key players i.e., economic think tanks, development organizations and policy makers must keep a close watch on the global prices while addressing domestic issues.

One possible avenue of extending the paper is to investigate the asymmetric causality of oil price for domestic inflation. Clearly, the way inflation soars when there is a price hike in the international oil market, domestic oil price or commodity price does not fall when the oil price decreases in the international market. Gradually, more and more complicated energy markets can be analyzed within the country. The study can also be further extended in the context of South Asia.

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A CASE STUDY OF THE NSU STARTUPS NEXT (NSUSN): FOSTERING ENTREPRENEURSHIP AND INNOVATION IN BANGLADESH

Samuel Mursalin¹, Ridwan Monir², Bente Fatema³

ABSTRACT

University business incubators (UBIs) give universities a dedicated entrepreneurship hub where young entrepreneurs with innovative business ideas receive mentorship, resources, and networking opportunities to lay the foundations for successful ventures and utilize the university's research outputs. Three years into the journey, North South University NSU Startups Next (NSUSN) has considerably impacted the Bangladeshi start-up ecosystem with its entrepreneurial education quality and business model, creating quality spin-off ventures and contributing to social and economic development. This article provides a case study for North South University's NSU Startups Next (NSUSN) which works with limited resources to support young start-up founders and provide value to the university entrepreneurs, the institution, society, and the economy. The study also outlined the model of NSU Start-up Next and provided insights on the outcomes obtained through its cohort-based system. The paper applies David J Miller's 'The Campus and the Ecosystem' framework to explain how a university's entrepreneurial ecosystem interacts with external stakeholders.

Keywords: Bangladeshi start-up ecosystem, Entrepreneurship, Regional development, Start-up incubator, University business incubator.

1. INTRODUCTION

Bangladesh-based startups have raised about USD 950 million from big-name investors like Softbank, Ant Financials, Tiger Global, and Sequoia (LightCastle Partners, 2023). The neighboring country, India, on the other hand, has raised more than USD 20 billion just in 2021 (Islam, 2022). SoftBank has gained recognition as the most bullish investors in Indian startups having backed large ventures which include Paytm and Policybazaar, as well as others such as Delhivery, Unacademy, Grofers, Oyo (Balakrishnan, 2022). Bangladesh has strong opportunities to develop the economy and take advantage of an annual global venture investment market of USD 650 billion (Islam, 2022). Furthermore, startups create employment opportunities alongside new kinds of work. In Bangladesh, both ride-sharing startups and food delivery startups have all together created employment for 1.5 million people directly and indirectly with potential to create a lot more jobs (Islam, 2022). Startups also bring innovation by challenging the traditional sector and creating value for consumers and the economy on a whole. For example, ride-sharing services like Pathao are breaking the taxi syndicate thereby making rides accessible and cheaper for everyone (The World Bank, 2019). Business-to-Business (B2B) commerce companies like ShopUp provide on-demand inventory delivery and credit to retail SMEs. Lastly, startups help support inclusive growth as they tap into markets that are not receiving the best value and eventually come up with products and services that create value for everyone. Agriculture technology companies, such as iFarmer, have benefitted smallholders by making their access to capital easier and telehealth services (e.g., Praava

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Health) have made access to medical consultation readily and remotely available for everyone (Islam, 2022).

In recent times, with the increasing importance of education to reach mass people, universities are tasked with nurturing entrepreneurship and innovation, generating revenues from research produced on campus, and contributing to economic growth on a whole (Etzkowitz, 1998, 2002; Etzkowitz et al., 2000; Goldstein and Renault, 2004). University Business Incubators (UBIs) can be considered research hubs for entrepreneurship stakeholders (Rice & Zahra, 2013). Universities and startups are naturally partners in most of the developed countries. Startups more or less require external sources of knowledge to assist their human resources and R&D. Often coming up with new products and services and modifying the existing products and services according to changes in consumer needs require sources of skills, knowledge, and creativity beyond the boundaries of the existing business. These require entrepreneurs to be involved in cooperation with customers, suppliers and research institutes. The involvement by the student entrepreneurs enhances the overall startup network eventually leading to many other opportunities associated with relevant industries (Chesbrough, 2006). Successful student entrepreneurs are frequently the key to social and economic growth in developing countries. Successful student entrepreneurs identify and, at times, influence the trends and patterns required for proper development of businesses in a region. So, proper and responsible entrepreneurship roles of the student entrepreneurs contribute to social and economic development. And UBIs can be considered as preferred partners in research related to developing a business, particularly where business results are uncertain. (Stal et al., 2016). Also, the Government has encouraged startups and innovation through policies that encourage investments and forming Startup Bangladesh Limited, a flagship venture capital fund under the Information, Communication, and Technology division of the Government of the People's Republic of Bangladesh (Islam, 2022). Startup Bangladesh Limited, which is a flagship venture capital fund of the ICT Division made its Vintage II investments amounting to Taka 17 crore to the country's 8 startups that are under an initiative 'Shotobarshe Shoto Asha', launched earlier marking 50 years of independence of Bangladesh (Islam, 2022). With the second series of investments, amounting to a total of Taka 34 crore were given to 15 more startups to scale up their products and services along with improvements in their qualities (Islam, 2022). Startup Bangladesh Ltd. announced to commit Taka 100 crore to 50 more startups for the year 2024 to create entrepreneurs and employment in the country.

This case study aims to provide insights on the role that business incubators can and should play in fostering innovation and entrepreneurship by examining how they have changed and evolved in response to changes in the larger entrepreneurial ecosystem. This is achieved by focusing on the development of startup companies in Bangladesh through NSU Startups Next (NSUSN). The primary questions posed and answered to in this paper are:

1. How do business incubators adapt to changes in the entrepreneurial landscape of a country?
2. What specific operational strategies do these incubators employ in response to dynamic shifts in the broader entrepreneurial environment in a country?
3. How do these adapted business incubators contribute to fostering entrepreneurship and innovation within the entrepreneurial landscape of a country?

2. LITERATURE REVIEW

This literature review section kicks off by introducing the context of the study. It chronicles the evolution of various incubation approaches as well as their importance in the entrepreneurial scene. Following this review of the historical frameworks, the section offers an in-depth look at the Bangladeshi startup environment. This overview includes information on the ecosystem's growth trajectory, prominent participants, and the dynamic forces that have driven its evolution. Several examples of UBIs in operation in Bangladesh are featured in the same section. This is followed by a succinct summary of previous research grounds and the extant work, pointing to a knowledge gap that this study is trying to address. Then the appropriateness of the chosen theoretical framework for addressing the gap and answering these research questions is discussed.

2.1 Research Context

2.1.1 The History of Start-up Incubators

The history of business incubators can be traced back to World War II which at that point of time served as a probable solution to keep the industrial districts from failing. War directly consumed over one-third of the total output from the industries worldwide, but the gradually expanded productivity ensured a satisfying supply of consumer goods to the people. The United States was the only country that considered an expansion of consumer goods despite wartime rationing (Bikse et al., 2016).

In the 1990s, academic entrepreneurship expanded, which led to an eventual increase of incubator programs on university campuses (Stal et al., 2016). UBIs currently exist all over the globe. University incubators are characterized by dynamic interactions between different individuals throughout the start-up incubation and graduation process. Business models are developed as entrepreneurs enhance their knowledge of available opportunities and resources (Rasmussen, 2011). The entrepreneurial teams of university-based startups evolve and change over time and their resource allocations have to be modified as the startups grow.

In the last thirty years, as the developed countries inclined more towards a knowledge-based economy, partnerships of universities with industries developed and led to the formation of more business incubators (Green & Venkatachalam, 2005).

According to the Global Entrepreneurship Index (GEI), there has been a 3% worldwide growth in entrepreneurship (2018). Entrepreneurial activities are essential contributions to economic growth and businesses are a crucial component of a country's economic engine. Without proper enterprise development and entrepreneurs who can take the lead, new job creation innovation is not possible (Acs, et al., 2018).

The Stockholm-based data and advisory firm, UBI Global, has assessed over 1,300 academic-based incubators in 53 countries including the United States, Brazil, Mexico, Canada, and Columbia (Castillo & Meyer, 2018).

2.1.2 History of University Business Incubators (UBIs)

The model of business incubators started to get attention in the early 1980s; and as the US universities were the first ones to realize its significance. During that time, more than 50 US

universities stepped into the race and established their own university incubators (Mian, 1996; pp. 191-208). In Europe, on the other hand, between 1995 and 2003, 131 out of 499 high-tech small medium enterprises that went public on the stock exchanges, were from university incubators (Bonardo et al., 2011; pp. 755–776).

Initially, UBIs were developed to commercialize academic research by creating a relationship between enterprises and university campuses. The goal of this relationship was to offer support infrastructure so that it can compensate for predictable inefficiencies in the market mechanism. At present, however, UBIs aim to develop products and technologies by focusing on research and development findings. University incubators nowadays thrive for end-to-end development rather than venerating only on profit (Bøllingtoft, 2002; Uihøi; 2005; pp.265-290).

University incubators come across a histrionic shift in the commercialization of scientific discoveries after the Bayh–Dole Act, enacted in 1980, favoring entrepreneurs against commercial exploitation, came into force in the year 1980. This revolution enabled U.S. universities to engage in technology transfer and licensing fearlessly, resulting in an eightfold increment of university technology licensing and fourfold increment of university technology patenting (Mowery & Shane, 2002; as cited in Markman et al., 2005). University incubators licensing income climbed by almost 315% between 1991 and 1997, from \$220 million to \$698 million (AUTM 2000, 2002; as cited in Markman et al., 2005).

At present, many countries around the world have policies in place to encourage the establishment of university incubators (Grimaldi et al., 2011; as cited in Meifang et al., 2020). As a result, the number of spin-offs has skyrocketed worldwide (Clarysse et al., 2005; as cited in Meifang et al., 2020). Researchers predict that by creating closer ties between research and industry, university incubators will not only surge information dissemination but also contribute to economic prosperity (Bonardo et al., 2011; pp. 755–776).

2.1.3 Overview of the Bangladeshi Start-up Ecosystem

In this paper, we infer the Triple Helix Model of Innovation as the startup ecosystem, entailing the interactions among academia, industry, and government to nurture social and economic development (Etzkowitz & Ledesdorff, 1995).

The startup scene has been heaving, as more and more businesses are coming out to satisfy unmet demands of the growing population across Bangladesh. There are around 1,200 active startups now with over 200 new ones forming every year. One of the key factors behind the growth in startup ecosystem in Bangladesh is due to the country's young tech adaptable population with 48 percent using smartphones and 68.4 percent having internet access across the country (Islam, 2022). The need for digitalization was further propelled by the COVID-19 pandemic as digitization became a must during and after the pandemic. Since post-pandemic consumption patterns are expected to boom globally, Bangladesh, with a digitally savvy population, is at a point lucrative for startups to take opportunity of (Islam, 2022). The momentum to encourage innovation through more startups was further amplified by enthusiasts from private sectors who manifested the startup initiation in the form of multiple accelerator and incubator programs (LightCastle, 2022). Currently, Bangladesh has more than 1,200 active startups that have drastically impacted day-to-day Bangladeshi lives through products and services that are new and innovative (LightCastle, 2022). Bangladesh attracted investment amounting to a total of USD 505 million in 2021 and 2022 (up to Quarter 2), with a total contribution of USD 498 million from global investors (LightCastle, 2022).

2.1.4 UBIs in Bangladesh

To cater the growing needs of the entrepreneur-driven ventures, a few prominent universities in Bangladesh have taken the initiative to set up university incubators. The following is a rundown of few university incubators in Bangladesh:

- **Daffodil Business Incubator (DBI):** Daffodil Business Incubator (DBI) was created in 2012 to meet expanding demand for co-working office space. Eventually, DBI accelerated and systematized the process of establishing successful businesses by offering a comprehensive and integrated variety of services, including incubator space, business support services, and every opportunity for clustering and networking (Daffodil Business Incubator, n.d.).
- **Business Incubation Center of BRAC University:** BRAC University's Center for Entrepreneurship Development (CED) runs the Business Incubation Center of the university. It was founded in 2016; and since then it has been running its operation with a goal of providing professional business incubation services (Business Incubation Center of BRAC University, n.d.).
- **Sheikh Kamal IT Business Incubator at Chittagong University of Engineering and Technology (CUET):** The incubator started its journey in 2022 with a goal of fostering entrepreneurship and contributing to the knowledge-based economy. The incubator is expected to aid in transforming creative ideas into goods and services to develop a "Smart Bangladesh" by 2041 (Mamun & Barua, 2022).
- **North South University Startups Next (NSUSN):** Founded in 2020, this university incubator is a platform for shaping and supporting early-stage entrepreneurs who demonstrate innovative technology and techniques for solving a social problem (NSU Startups Next, 2020).

2.2 Analogous Studies and Unaddressed Research Areas

In recent years, there has been a noticeable rise of university incubators that are likely to play a crucial role in research and innovation management in Bangladesh. Positioned between universities and industry, these incubators now serve as intermediaries, and have become essential mediators in the innovation process. This has given rise to studies that look into the dynamic relationships through a variety of case studies. For example, Rothschild and Darr (2005) have looked at the structure and nature of relationships among incubators, universities, and the industry in Israel. Nicholls-Nixon et al., (2021) have discussed the lifecycle of university business incubators by focusing on a business incubator of Canadian university. Some studies have examined the economic indicators of such incubators by doing a meta-analysis of university incubators (e.g., Al-Mubarak & Busler, 2012). Moreover, the success factors of business incubators have been identified by Wiggins and Gibson (2003) by focusing on the incubator at an American university; and Famiola and Hartati (2018) by focusing on the incubator at an Indonesian university. These studies provide a comprehensive idea of entrepreneurial ecosystems and its underlying intricacies in their respective country or region.

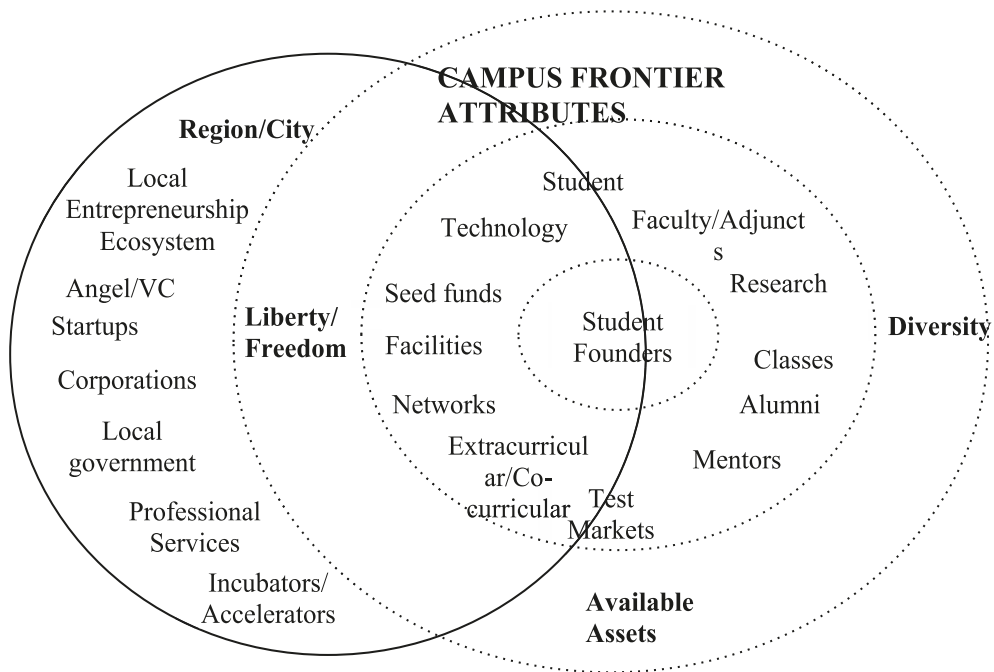
However, none of the previous studies has examined how the structure and operation of business incubators transforms in regard to the changes in wider entrepreneurial ecosystems. It has been the focus of prior research, in particular, to find out how business incubators perform, and how they impact certain contexts, such as economies and societies where they operate. While these studies have provided important insights into the efficacy and functions of incubators, very little research has been done on how these incubators adapt and evolve over time in response to dynamic changes

in the broader entrepreneurial environment. In this study, this gap is addressed by investigating how business incubators adapt to changes in entrepreneurial ecosystems, what these incubators do differently in their operations, which ultimately foster entrepreneurship and innovation. As such, this research contributes to closing the knowledge gaps related to the structure and operation of such incubators, and their interactions with the startup ecosystem.

3. DAVID J. MILLER’S ‘CAMPUS AS ENTREPRENEURIAL ECOSYSTEM’ MODEL

The focus of recent research on entrepreneurial ecosystems has shifted from developed economy to emerging economy, as a number of scholars have begun to investigate entrepreneurial ecosystems in emerging economies like China, India, and Brazil (Armanios et al., 2017; Goswami et al. 2018; Jnior et al. 2016). The key difference between emerging countries and advanced economies as a whole is that there is a dearth of research on entrepreneurial ecosystems framework in the emerging economies (Cao and Shi, 2021). One framework that holistically addresses the dynamics of entrepreneurial ecosystems in emerging economies is proposed by Miller (2016). In this study, Miller employed a model for addressing the literature gap and answering the research questions posed in this study. This model is utilized to explain how a university’s entrepreneurial ecosystem interacts with external stakeholders. The two circles in Figure 1 below represent the university entrepreneurship ecosystem and the external environment of the university.

Figure 1: The Campus and the Ecosystem (Adapted from Miller, 2016)



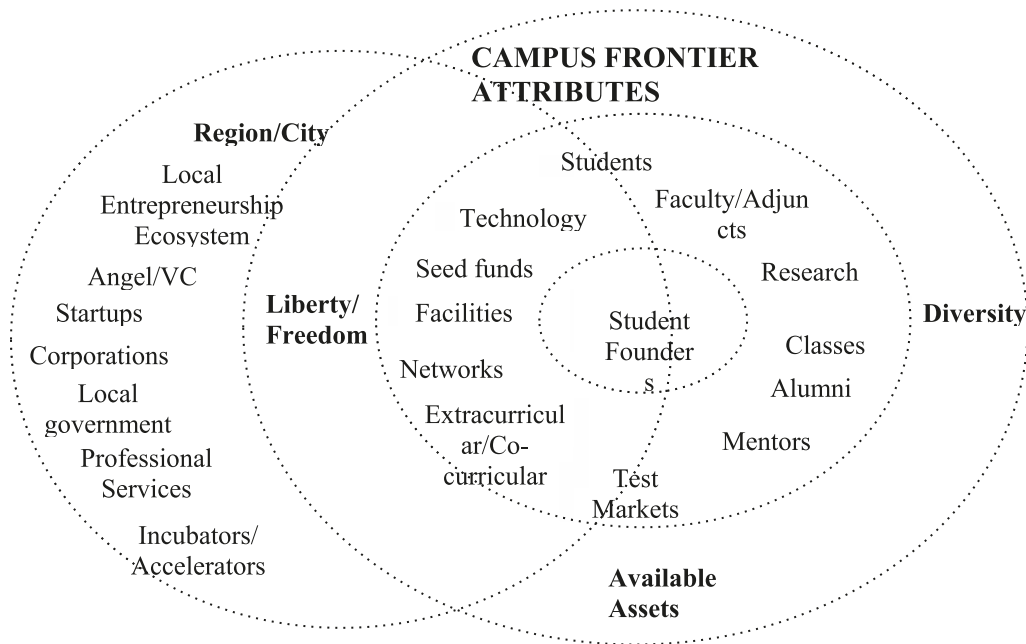
The dotted circle of the university entrepreneurship ecosystem demonstrates an openness to collaboration with external stakeholders. The inner circle of the university entrepreneurship

ecosystem consists of student founders and university facilities; and the outer circle consists of available assets, liberty and diverse populations.

The solid circle of the external stakeholders showcases a lack of openness and permeability to collaboration. This circle has stakeholders such as investors, accelerators, government, professional service firms, and a few others. Miller explains that external stakeholders work within particular policies and budgeting boundaries, restricting their freedom to engage with universities.

As the Bangladeshi start-up ecosystem grows, more angel investors, venture capitalists, corporations, the government, incubators and accelerators, and professional service provider firms are keeping high-growth start-ups at the center of their policies and budget commitments. Bangladesh Angels (Bangladesh’s largest angel investor network), Anchorless Bangladesh (a leading Bangladeshi venture capitalist firm), and many other investors’ network actively participate with NSUSN’s core operations. Grameenphone Accelerator, a leading startup accelerator of Grameenphone, Bangladesh’s top telecom operator, actively works with NSUSN and its portfolio start-ups. The Bangladeshi government has taken multiple initiatives to support Bangladeshi startups. Startup Bangladesh Ltd. is the government’s venture capital initiative that invests in early-stage and growth stage startups. Innovation, Design, and Entrepreneurship Academy (iDEA) project is the government’s initiative to support idea-stage and early-stage start-ups rigorous mentorship and grants. Both the organizations readily engage with NSUSN’s start-ups and have provided investments, grants, and mentorship. Multiple local and multinational corporations actively engage with NSUSN’s program as mentors, clients, corporate investors, and advisors. Professional legal, marketing, website, research, and other vendors support NSUSN start-ups with tailored products and pricing. As a result, the current study suggests that the solid circle of the external stakeholders be a dotted circle, like the dotted circle of the university entrepreneurship ecosystem (Figure 2).

Figure 2: The Campus and the Ecosystem (Adapted from Miller, 2016)



4. METHODOLOGY

Qualitative case study methodology was employed to find answers to the research questions. The adoption of this approach allowed the exploration of complex phenomena in a more meaningful, rich way, and was able to provide a deeper understanding of the situation than it would be with a more quantitative approach. Due to the vast amount of information gathered through the analysis of the two entrepreneurial cohorts, the case study research design was also appropriate given the enormous amount of qualitative and exploratory data gathered. Moreover, there are multiple data sources that are used in conjunction with the case study approach to facilitate the establishment of converging lines of investigation and multiple assessments of the same phenomenon (Yin, 2009).

We can trace the rationale of the case study technique (Yin, 1981) back to our research purpose since it scans a phenomenon within a real-life setting, which is relevant to our research goals. The dimension of richness, meaning, and insight of the collected data was the criterion used when studying samples in the case study method. The essential idea behind the selection of instances was the variance and multiplication of real-world experiences, rather than the representation of the parent population within the sample (Patton, 1990).

There are few independent and overlapping processes that were used to collect and analyze the data. In the first part of the document analysis process, we examined the content of many business incubator platforms' websites around the world as well as in Bangladesh in order to discover and compare the business models and incubation operations of the platforms. This was reinforced by a number of public documents that described the operations, policies, and commercial strategies of the platforms, which were clear and concise. In addition, relevant scholarly and media publications were reviewed in order to provide a comprehensive picture.

Secondly, various participant observations have been collected over the course of the three years of empirical research, spanning from 2020 to 2022. In this study, we drew a sample of startups from these two entrepreneurial cohorts. In the first instance, the first cohort of the project received approximately 200 applications, which laid the groundwork for further investigation in the coming months. Later on, there was an evaluation of the second cohort, which received approximately 160 applications. Moreover, the authors have been given access to the community membership that allowed us to monitor multiple investment campaigns over the period of two years.

The final step of the process was to conduct semi-structured interviews with the director, coordinators and program assistants of NSUSN to gain the most comprehensive understanding of the startup incubation process. We interviewed one of the coordinators of NSUSN, who is responsible for the internal operations of the program, including the start-up incubation and the management of stakeholder relationships with the external stakeholders. For the purpose of identifying network interactions, the program assistants were asked about the type of support startups seek, as well as what form that support takes to uncover network interactions. Following that, we extended the scope of our interviews to key support organizations that those startups had mentioned in their interactions with us. While these entrepreneurs and support organizations are the core of our analysis, we conducted additional interviews with people who were identified by entrepreneurs, such as mentors, as well as multiple field observations of networking events and speaker events within the ecosystem, as well as additional interviews with individuals identified by entrepreneurs. To better understand the logic and dynamics involved in the valuation of startups, the data collected has been analyzed, evaluated, and triangulated with data from other sources.

5. DISCUSSION

The purpose of this section is to provide a comprehensive understanding of NSUSN, its structure and its work processes, thereby providing a clear understanding of what sets NSUSN apart from other university incubators and how such differences in structure and operation make it adaptive to changes in the entrepreneurship ecosystem as a whole. An overview of these changes can be found in the extended theoretical framework that serves as a depiction of them.

5.1 Inception of NSU Startups Next (NSUSN)

North South University (NSU) is Bangladesh's oldest and most prestigious private university. Established in 1992, the university provides top-quality undergraduate and master's degree programs that follow the North American curricula. The university consistently ranks top among the country's private universities (NSU, n.d.). The state-of-the-art 5.5-acre campus at Bashundhara, Dhaka, can accommodate up to 22,000 students.

Four schools provide all education programs of NSU: the School of Business and Economics (SBE), the School of Engineering and Physical Sciences (SEPS), the School of Humanities and Social Sciences (SHSS), and the School of Health and Life Sciences (SHLS). Each school has numerous research centers and labs that foster a culture of innovation, collaboration, and experimentation. The university has dedicated research centers and labs for global health, genome research, business research, biotechnology, microbiology, infrastructure research, and many others. In 2015, NSU School of Business and Economics (NSUSBE) became the first business school in Bangladesh to receive the Accreditation Council for Business Schools and Programs (ACBSP) accreditation (NSU, n.d.).

In 2018, the Bangladeshi start-up ecosystem was still in its infancy. Pathao (Bangladesh's biggest on-demand digital platform that provides ridesharing, food delivery, courier, medicine, and other services and was founded by an NSU alum) was only in its third year of operations. Other notable Bangladeshi start-ups founded by NSU alums, such as Chaldal (a grocery e-commerce platform), ShareTrip (an online travel aggregator), Truck Lagbe (a freight and logistics start-up), and iFarmer (an agro-fintech company that connects investors with farmers), were in their very early days. Considering that the NSU entrepreneurs were doing exceptionally, the NSU think-tank quickly realized that structured support from a dedicated entrepreneurship center would create more successful entrepreneurs and contribute to the country's social and economic development.

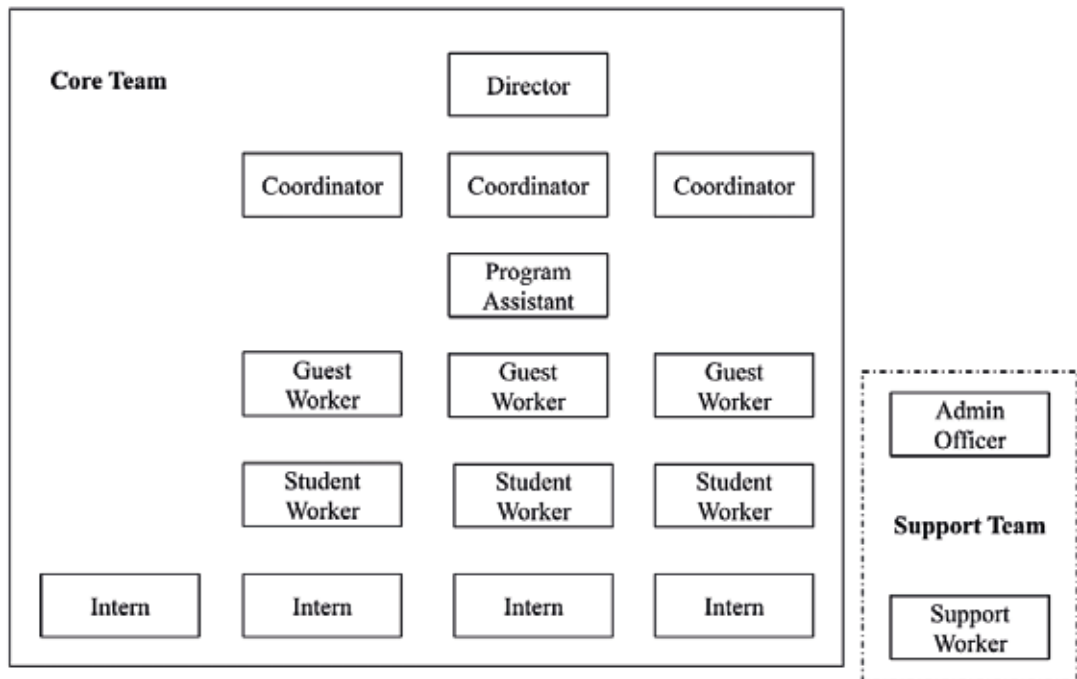
To better understand what internationally recognized university business incubators do and how they create social and economic value through entrepreneurship development, NSU officials visited the MQ Incubator, the university business incubator of Macquarie University in Sydney, Australia. Much of the program structure of NSUSN is inspired by the MQ incubator model.

A thorough brainstorming process among the major stakeholders, including multiple schools and department heads, administrative leaders, and top industry professionals, of NSU commenced. In late 2019, the administration approved the formation of an interdisciplinary university business accelerator.

5.2 NSUSN Organogram

The head of this incubation program is a director, a part-time position for a full-time faculty member of NSU. The Director is supported by two Coordinators, part-time positions for full-time faculty members of NSU. The Coordinators are responsible for the internal operations of the program, including the start-up incubation, and external stakeholder management. The organogram has a vacancy for another Coordinator that has not yet been filled yet. A guest worker, usually a part-time position who has a bachelor’s degree, assists each Coordinator. The incubation center also hires student workers, current students of NSU, and interns to support the guest workers and the coordinators.

Figure 3: NSUSN Organogram

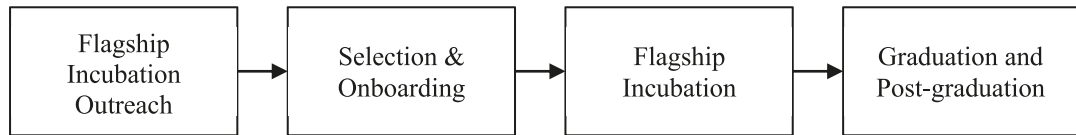


5.3 The NSU Startups Next Model

NSU allocated a 2000-square-foot space for NSU Startups Next on the ninth floor of the North Academic Building (NAC) in the Bashundhara, Dhaka campus. The space is divided into three major segments: a 250-square-foot office for the NSUSN staff members, a 1500-square-foot coworking space, and a 250-square-foot board meeting room. According to the approved plan, the program had offline and online components to incorporate local and international start-ups, mentors, advisors, investors, and other critical stakeholders. Because of the COVID-19 pandemic, all the activities had to be shifted online.

Program Overview: NSUSN implements a cohort-based system and serves one cohort per year. Each cohort has four major components: outreach, selection and onboarding, incubation, and graduation and post-graduation (Figure-4).

Figure 4: Major Cohort Components of NSUSN



Flagship Incubation Outreach: Outreach is a 2-month activation campaign that NSUSN conducts to reach out to aspiring entrepreneurs, educate them about the benefits of joining the program, and encourage and assist them in applying for the upcoming cohort. During the outreach, numerous flagship webinars, ask-us-anything webinars and seminars, and start-up clinics are organized.

Flagship webinars are hosted by NSUSN, where top local and international start-up professionals engage in informative discussions on crucial start-up topics. Previous flagship webinars had topics such as 'The Next Big Idea, solving for the Community, Finding Money That Matters, Evolution of Your Product' and many others. The core objective of these webinars is to increase the entrepreneurial knowledge of young start-up founders on vital topics related to navigating start-ups successfully. In addition, the entrepreneurship community can engage in discussions with prominent start-up professionals.

Ask Us Anything (AUA) webinars and seminars are conducted by the internal NSUSN team, where NSUSN primarily partners with its student organizations and other Bangladeshi universities to answer the queries of potential university entrepreneurs. The NSUSN team explains the program and the eligibility criteria to the university students and allows the audience to interact with the NSUSN team and ask questions. For the AUA sessions within NSU, NSUSN partners with seven prominent NSU student organizations, such as NSU Young Entrepreneurs Society, NSU Young Economist Forum, NSU Marketing and International Business Club, NSU Finance Club, NSU Human Resource Club, NSU Social Services Club, and NSU Association of Computing Machineries. The AUA sessions are held both online and in-person on the campuses of NSU and other Bangladeshi universities.

Start-up Clinics are day-long one-on-one free start-up consultation services that the NSUSN team provides to aspiring university entrepreneurs. Anyone can book time slots and get a consultation from an NSUSN team member.

The outreach activities ensure that NSUSN can promote its program to university students and encourage them to apply for the program. Aspiring start-up founders fill out a standard application form at NSUSN's website. The application form collects details such as the education and work experience of the founders, pitch deck, legal documents, capitalization table, and many others.

Selection and Onboarding: After attracting an application pool, the NSUSN team conducts a rigorous selection process to identify the best start-ups. The following are the factors that NSUSN considers during the selection:

Figure 5: NSUSN Selection and Onboarding Criteria

Factors	Considerations
Idea viability	- size and intensity of the problem - practicality of the proposed solutions
Market research	- clear articulation of market size - in-depth customer knowledge - in-depth competitors' understanding
Scalability	- ability to create a solution that can reach customers rapidly and serve demand influx with minimum physical intervention
Team	- at least one founder needs to be an NSU student or an alum. The other co-founders can be from other universities. - right technical skills - right interpersonal skills - startup mindset

First, the internal NSUSN team screens out ineligible applications, such as incomplete or the ones that do not meet the essential eligibility criteria. Previously, the two most common rejection reasons in this stage were that no founder was a current student or an alum of NSU, and the business idea was not a start-up (rather a small-and-medium enterprise or a social business). The fact that the other co-founders can be from other universities makes the program more inclusive than other traditional UBIs that cater to their university stakeholders only. Second, the internal NSUSN team critically evaluates the remaining pool regarding idea viability, market research, scalability, and co-founding team quality. Major rejection causes at this stage include poor market size calculations, not knowing the customer needs critically, lack of knowledge of what the competitors do, and the incapability of the co-founding team to turn the idea into a scalable commercial venture. Third, shortlisted companies pitch in front of the internal and external advisory boards of NSU Startups Next. The internal board consists of the Deans of the four NSU Schools, the Director of NSUSN, and the Director of MBA & EMBA programs. The external board consists of a diverse pool of top industry experts from venture capital firms, legal firms, established start-ups, and the development sector. The advisors engage in a thorough Q/A session with every team and provide scores to each in a Google Form on the factors mentioned in table n. Finally, the top six to eight teams are selected for the flagship incubation. Before the final onboarding, NSUSN conducts a thorough background check of the co-founders for any information discrepancies that the teams provided and past criminal records.

Flagship Incubation: The 4-month flagship incubation introduces the start-up founders to the top local and international experts who provide firsthand and tailored mentorship and guidance. Previously, mentors from international giants like Google, Amazon, TikTok, Microsoft, and Uber and reputed local companies like bKash, Pathao, Sharetrip, and iFarmer conducted mentorship sessions at NSUSN.

The flagship incubation has two significant components: mentorship sessions and key performance indicator reviews (KPIRs).

A 15-module mentorship curriculum is designed to give the young start-up founders concrete and diverse foundational and advanced knowledge on how to run a start-up. The following is the curriculum:

1. Investor communication and fundraising 101
2. Legal and financial compliance
3. Revenue models
4. Data and analytics
5. Branding and storytelling
6. Mental health and wellbeing
7. Customer development
8. Financial modeling
9. Culture and team development
10. Business model that scales
11. Start-ups for social impact
12. Crafting the perfect pitch deck
13. Digital marketing for tech products
14. Choosing the right tech stack
15. Creating investor funnel

Every week, the founders receive one (sometimes two) mentorship sessions. In addition, each team must schedule a one-on-one session with each mentor to get tailored guidance and feedback.

The KPIRs are weekly meetings between the founders and the internal NSUSN team. In these meetings, the Coordinators of NSUSN provide thorough guidance and feedback and remove any operational and external bottlenecks for the founders, allowing the founders to scale fast. In addition, the coordinators introduce the founders to key external stakeholders, such as clients for B2B partnerships, marketing vendors, legal vendors, investors, government offices, research agencies, universities, and many others. Finally, the Coordinators assign quantifiable goals that each start-up must attain weekly. Attaining these goals increases the chances of the start-ups to graduate successfully from the program.

Two progress review sessions (one after five weeks and the other after twelve weeks of incubation) are organized where the start-up founders share their progress with the internal and external advisors. Based on the progress, the advisors provide scores to each start-up on four criteria:

1. Product development
2. Business model
3. Team coachability
4. Fundraising

The scores of the KPIRs that the coordinators and the progress review sessions that the advisors provide determine which start-ups graduate from the program.

Graduation and Post-graduation: At the tail-end of the incubation period, the NSUSN team evaluates teams' progress during the program. Graduating teams will have launched their products in the market, attained a working business model that attracts customers and allows rapid scaling, acted upon the experts' feedback, and raised seed funding. Graduation from the program signals a seal of approval for the teams to the prominent start-up stakeholders in the ecosystem.

The Graduation is a public event that invites influential government officials, the NSU Board of Trustees, investors, start-up founders, NSUSN's internal and external advisory panels, young aspiring student entrepreneurs, and other ecosystem builders.

After the Graduation, NSUSN conducts a 2-month bi-weekly post-graduation program. The NSUSN team provides further scaling and investment facilitation services in this program. In addition, NSUSN organizes on-demand mentorship sessions that help the graduate start-ups with more mature topics, such as international legal incorporation, cloud security, international expansion, paperwork for international VCs, and many others. In addition, NSUSN organizes 'Investors Day' in collaboration with Bangladesh Angels. On Investors Day, the graduate start-ups pitch their start-ups to a huge and diverse angel investor's network for pre-seed funding. Finally, NSUSN organizes 'Meet the Corporates,' where professionals from top local and multinational companies network with NSUSN's portfolio start-ups and explore mutually beneficial business relationships.

5.3.1 A New Strand: The Pre-Incubation

The Bangladeshi start-up ecosystem is in its infancy. The Bangladeshi start-ups have raised a total of USD 800 million (Lightcastle, 2022); a sum that Klarna, a European financial technology company, has raised (Sawers, 2022). Considering that the Bangladeshi start-up ecosystem had 1200 active start-ups (as of June 2022) and the established start-up failure rate worldwide is 90%, the number of high potential start-ups that business incubators could work with was not very promising.

For NSUSN, the shortage of quality start-ups is further compounded by the fact that one of the co-founders must be a current NSU student or an alum, making the overall consideration pool even smaller. Moreover, start-ups getting into the flagship incubation were required to have a minimum viable product and market traction. NSUSN quickly realized that it needed to create start-ups organically through start-up education and hands-on mentorship. As a result, NSUSN introduced a new program: pre-incubation.

Pre-incubation is a 2-month mentorship program for idea-stage start-ups that may not have a minimum viable product or even a co-founding team. An aspiring individual start-up entrepreneur can join the pre-incubation program with a prospective idea only. The objective of the pre-incubation is to educate a bigger pool of quality entrepreneurs and create more start-ups that can join the flagship incubation.

The pre-incubation outreach campaign is very similar to the flagship incubation outreach. One additional initiative that NSUSN takes is 'Connecting Co-founders.' Connecting Founders is a networking event where NSUSN invites interested start-up entrepreneurs from different backgrounds to network and onboard co-founders. The previous editions of Connecting Co-founders attracted students and early-stage professionals from diverse backgrounds such as marketing, finance, supply chain, software engineering, electrical engineering, mechanical engineering, psychology, biotechnology, and many others.

As the pre-incubation start-ups are mainly at the idea-stage, the co-founders can regularly sit down with the NSUSN Coordinators to take feedback on co-founder(s) onboarding, initial market research, minimum viable product, pitch deck, capitalization table, and other foundational elements required to start a company.

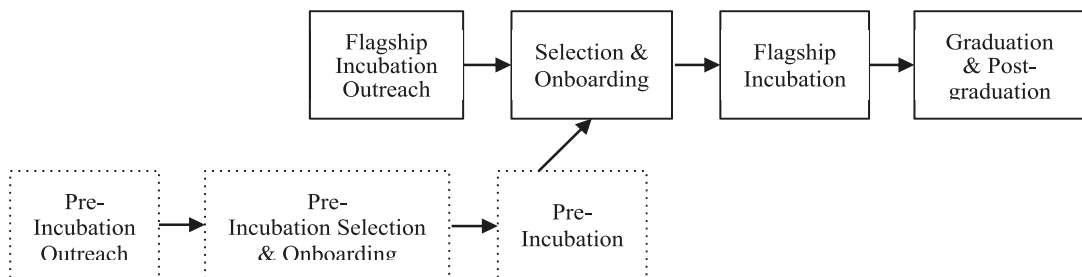
Interested teams apply for the pre-incubation using the application portal at the NSUSN website. The pre-incubation selection and onboarding process is very similar to that of the flagship incubation. The ineligible applications are first screened out and then the internal NSUSN team conducts one round of screening based on idea viability, market research, scalability, and team. Finally, a pitch presentation in front of the Senior Adviser and the NSUSN team determines which start-ups are onboarded to the pre-incubation.

Keeping in mind that the pre-incubation start-ups are at the idea stage, NSUSN has designed a preincubation mentorship curriculum that is more basic compared to the flagship incubation sessions. In parallel to the weekly mentorship sessions, NSUSN also conducts weekly KPIRs. The following is the preincubation mentorship curriculum:

1. Marketing research
2. Building MVPs to attain problem-solution fit
3. Your first customers
4. Basics of digital marketing
5. Key startup metrics and KPIs
6. Crafting the perfect pitch deck
7. Teambuilding and culture
8. Company registration

The teams that complete the preincubation are then invited to apply for the flagship incubation program. Start-ups that complete the pre-incubation program successfully have a 50% greater chance of getting selected for the flagship incubation program.

Figure 6: Major Cohort Components (Revised)



6. RESULTS

Due to its unique structure and progressive design process, NSUSN has been able to take advantage of the changes of the entrepreneurship ecosystem and utilized them in a way that the association keeps fostering entrepreneurship and innovation in Bangladesh. This is evident from the successful completion of two entrepreneurial cohorts. The details of the landmarks are as follows:

From the outreach programs, the first cohort attracted around 200 applications and the second cohort received around 160 applications. The first cohort started with six start-ups and has successfully graduated four. Out of these four, three are operating and one has shut down. The three graduate start-ups from the first cohort have raised a combined seed funding of USD 980,000 and employ around 65 people. The two that did not graduate changed their business models to become

SMEs. The second cohort attracted around 160 applications. The four graduate start-ups from the first cohort are Thrive, Loox, Hypescout, and Kalke. Thrive, an education technology company, joined Iterative, a start-up accelerator based in Singapore. Loox, a live fashion commerce platform, joined SM-square accelerate, a start-up accelerator backed by SBK Tech Ventures (venture fund for technology companies in emerging markets), SOSV MOX (a development program for tech companies backed by SOSV), and Miaki (a company with expertise in product development and content). Hypescout has raised venture capital from Anchorless Bangladesh, an early-stage venture fund that invests in Bangladesh start-ups. Kalke, a human resource (HR) technology company that built a software-as-a-service (SaaS) platform for HR administrative tasks, raised around USD 16,000 but eventually failed to survive.

The second cohort started with four start-ups and three have successfully graduated. The three graduate start-ups from the second cohort have raised a combined seed funding of USD 300,000 and employ around 30 people. The one that did not graduate has raised around USD 80,000 and is operating in the market. The three graduate start-ups from the second cohort are Bimafy, Chaya, and Cleinsight. Bimafy, an insurance marketplace, has raised investments from Startup Bangladesh Ltd., a Bangladesh government-backed venture fund. Chaya, a housing solutions platform for bachelors, has raised investments from a Bangladeshi angel investor and received grants from Innovation Design and Entrepreneurship Academy (iDEA), a Bangladesh government-backed initiative to support idea-stage companies. Cleinsight, a market research platform, has also raised an initial investment and is working with some of Bangladesh's top telecom and fashion brands. Table 1 presents the numerical achievements of NSUSN in a tabular form for a better understanding of the incubators's considerable impact.

Table 1: NSUSN Entrepreneurship Program Cohort Data: Applications, Start-ups, Graduations, Funding, and Employment

Cohort	Number of applications	Number of start-ups	Number of graduations	Number of start-ups that raised funding	Number of people employed by the graduate start-ups
First	200	6	4	3	65
Second	160	4	3	3	30
Total	360	10	7	6	95

Therefore, North South University NSU Startups Next (NSUSN), a university incubator, has achieved remarkable results in a short period of time. Here is a summary of their key achievements:

- Raised USD 1.2 million in investment, with 90% coming from international investors. This shows the strong confidence that global investors have in the quality of startups incubated by NSUSN.
- Created 60+ new jobs and launched 30+ new companies. This is a significant contribution to the startup ecosystem in Bangladesh, and it is helping to create new opportunities for young people.
- Graduated 7 startups from the flagship incubation program and 4 startups from the pre-incubation program. This is a testament to the effectiveness of NSUSN's programs in helping startups to grow and succeed.

Overall, NSUSN is having a significant impact on the startup ecosystem in Bangladesh. It is attracting international investment, creating jobs, and launching new businesses. NSUSN is also playing a key role in developing the skills and knowledge of young entrepreneurs.

6.1 Value to Entrepreneurs

NSUSN works as a catalyst that helps entrepreneurs to independently work on entrepreneurial ideas that they have harbored. The setting provides a conducive environment for the development of business opportunities where ideas are recognized, explored, developed, fostered and elongated. This conducive environment consists of tangible as well as intangible attributes. Entrepreneurs, when they become a part of NSUSN, they receive certain intangible benefits from the university. Firstly, they receive effective grooming, training and monitoring from the seasoned staff members who have been strategically placed to accelerate and enrich their entrepreneur journey. The training and grooming take place exclusively for each and every start-ups, keeping both macro and micro environment in mind. Start-ups nurtured by NSUSN are organized in a way which allows entrepreneurs to wear a lot of hats at the same time. This way, entrepreneurs learn about different job roles as well as develop sound business skills. This also enables an entrepreneur to draw a balance between technical and managerial capabilities. Also, such loosely defined roles of entrepreneurs allow a start-up to be goal oriented rather than task oriented.

Entrepreneurs also receive advice from experts and professionals from different industries from time to time. NSUSN also enables entrepreneurs to access a wide network of investors and executives with extensive experience for funding which would be inaccessible otherwise. It also guides the entrepreneurs to obtain their relevant regulatory approvals when necessary. Besides, NSUSN creates a bridge between the entrepreneurs and North South University's vibrant and accomplished alumni network from which the entrepreneurs are widely benefited as the network opens doors of opportunities, tapping on which entrepreneurs can turn their start-ups into thriving businesses. Apart from the intangible benefits, NSUSN also provides space for coworking, conference and meeting that a start-up might require in its founding years.

6.2 Value to the Institution

NSUSN has opened doors for North South University where it can commercialize its academic research sourced from Office Of Research - NSU (OR-NSU), which is responsible for developing regulatory policies and procedures and enhancing and facilitating internal and extramural grant opportunities (Office of Research: North South University, n.d.). The mission of OR-NSU is to collaborate with international agencies for the purpose of advancing local science and technology innovation as well as with government, professions, and industry to advance local science and technology innovation (Office of Research: North South University, n.d.). NSUSN has given this office a platform where it can pivot research findings in new businesses for economic development. This linkage has been proven beneficial for both offices. NSUSN accesses the exclusive research results that is being conducted by OR-NSU and on the other hand, OR-NSU identifies the potential research area through NSUSN. Meanwhile, the university is being benefitted through this direct relationship between the research outcomes and business development.

With the presence of NSUSN, North South University was successful in creating an image for itself as an acquiescence of its civic responsibility. Recently, the university has made into news where it was addressed that currently, there is no other college or university in Bangladesh that produces more entrepreneurs than NSU (Rabbybhn, 2022). This reputation was earned as NSUSN has

enabled many start-ups to flourish and expand. Also, start-ups nurtured by NSUSN has created a lot of jobs around it. Besides, NSUSN grooms the start-ups keeping the Sustainable Development Goals (SDGs) of UN in mind. This has enriched the socially responsible institution image of the university even further.

6.3 Value to the Society

NSUSN contributes to the social connection as the incubator increases and improves networking among its members within the context of a society along with increased communications and opportunities. NSUSN has created new job opportunities contributing to the society's overall employment and income ratio and at the same time the organization makes new products and services available to the consumers at lower prices with easier accessibility. It is because NSUSN increases the number of business channels through which products and services flow along with number of variants in a product or service category or line. All of these on a whole provide consumers within the societal context with more options to make better choices from while they purchase a product or avail themselves of a service.

The ethical concerns regarding misconduct and illegal deals among businesses are also minimized to an extent by NSUSN. NSUSN is an university based incubator and like most other academic institutions, the university focuses on fostering an ethical sense of conduct and morality among its students. Therefore, the businesses initiated and developed through NSUSN by the academic members are inclined more towards activities that ensure proper legal structures and ethical standards being maintained among the various stakeholders of the businesses and within the businesses themselves. Assurance of proper ethical standards and conduct within businesses benefit the society as these ensure both consumer and worker rights as well as safety of the people within a society being given to them both through the corporate and industry level manufacturing sector.

6.4 Value to the Economic Development of Bangladesh

The economy of a country is highly influenced by the success or failure of the startups and the innovation these businesses bring with the changing consumer demand over time. NSUSN has been providing its members with greater connectivity and legitimacy along with important contingencies regarding business strategies and models that are associated with the community stakeholders and important industries. These influences the long run success of the startups and eventually helps the economy to grow as these businesses grow after being successful. Also, the transfer of scientific and technological knowledge through NSUSN is vital for the economy since these contribute to economic development as incubated firms outperform non-incubated firms in terms of both sales' growth and employment. One of the objectives of NSUSN is to assist startups with unique and value-added resources that include knowledge, technology alongside access to academic networks.

Even though in a small amount the startup business facilitated by NSUSN and other similar UBIs contribute to the country's GDP, currently 0.10 percent of the current GDP. Between 2020 and 2021, Bangladesh experienced the largest increase in startup investments among neighboring countries, with a nearly ten-fold increase in the investment with added perks of new employment opportunities and increased consumer demand being met creating sustainable value for the economy on a whole.

7. THEORETICAL CONTRIBUTIONS

This paper contributes to existing theories concerning entrepreneurship and innovation by enriching them. The report does this by providing supporting evidence that outlines how a particular entrepreneurial ecosystem, such as Bangladesh's startup ecosystem in this case, can adapt to changes in the environment and evolve over time as its environment changes. In this case, the framework provided by David J Miller in 2016, known as 'The Campus and the Ecosystem' model, was extended in the context of the Bangladeshi startup ecosystem to represent a change in the connection between the university's entrepreneurial ecosystem and external stakeholders. Here's how the framework was expanded:

Firstly, there has been a change in the circle of external stakeholders. The external stakeholder circle was originally portrayed as a solid circle, indicating restriction of flexibility and engagement with institutions. However, in the context of the Bangladeshi startup ecosystem, the external stakeholder circle was modified into a dotted circle. It is clear that this development is the result of a gradual change in the attitudes of outside stakeholders who have become much more accepting and accommodating of university incubators, as well as the startup programs they are associated with, including NSUSN.

Secondly, some new key external players have been included in the system. The framework has also been extended to include specific external players and organizations that have been actively involved in supporting startups on their way to becoming high-growth companies in Bangladesh by providing them with development assistance. Angel investor networks such as Bangladesh Angels, venture capital firms such as Anchorless Bangladesh, startup accelerators such as GP Accelerator, Bangladeshi government initiatives such as Startup Bangladesh Ltd. and the iDEA project, and various local and multinational corporations are among these actors. The bigger external stakeholder ecosystem now includes these organizations as a component.

Thirdly, the extended model has identified a spark in the level of collaboration and support between external stakeholders and university incubator. The transition of the external stakeholder circle from a solid to a dotted circle suggests that external stakeholders in Bangladesh are now keener to cooperate with university-affiliated startup initiatives like NSUSN. This is because they actively promote startups through a variety of means, including, but not limited to, finance, mentorship, and resources.

Last but not least, there has been a change in the commitments made in terms of budget and policy. The extension also emphasizes that external stakeholders in Bangladesh have made policy (e.g., Startup Bangladesh Ltd.) and budget commitments (e.g., Bangladesh Angels) to help startups with high-growth potential. A commitment such as this stands in sharp contrast to the previous model, in which external stakeholders were bound by policies and financial restrictions as part of the system.

It can be concluded that the extension of David J Miller's 'The Campus and the Ecosystem' model, as applied to the Bangladeshi startup ecosystem, offers a valuable theoretical contribution to the field of entrepreneurship and innovation. The extended frameworks demonstrate a promising transformation, where the interaction between Bangladesh's external stakeholders and the university's entrepreneurial environment has become more inclusive and supportive as a result of this transformation. The case emphasizes the importance of improving cooperation, openness, and active assistance from outside parties in order to encourage the growth of entrepreneurship and innovation within the nation.

8. LIMITATIONS

This study focuses in-depth on the business model and the impact of one Bangladeshi university business accelerator that is still in its early days and is growing in reputation in the Bangladesh start-up ecosystem. NSUSN operates on a limited budget and human resources. Currently, the office has a Director, two Coordinators, two guest workers, four student workers, and two office assistants. Other than the two office assistants, the other employees are part-time. The Director and the Coordinators are full-time faculty members and researchers of NSU. The guest workers are recent graduates and the student workers are current students of NSU. With limited resources, the incubator has produced admirable results.

A significant limitation of the study is that crucial metrics, such as customer growth, customer retention, customer acquisition cost, revenue growth, burn rate, and many others, could not be gathered. Interviews of the start-up founders could not be organized. Moreover, NSUSN does not track these numbers. Conducting an exit interview of the graduate start-up founders to understand the program's impact and observe the key metrics improvements will benefit both NSUSN and similar future studies.

In addition, the value that the incubator generates for the wider community, such as the students who want to nurture entrepreneurial skills without getting into the incubation programs or entrepreneurs who were not selected for the incubation programs, could not be measured because of a lack of available data at NSUSN. Similarly, NSUSN's impact on student entrepreneurs in other universities could not be measured. Students with SME or social business models also received informal guidance from the Coordinators, but the impact could not be measured.

Inputs from various stakeholders (clients, customers, investors, accelerators, and government entities) that closely work with the NSUSN portfolio and non-portfolio companies would have added new dimensions to the study.

Additional data points and more in-depth stakeholder analysis would have made this study more comprehensive. Due to limited resources, these opportunities could not be explored.

9. CONCLUSIONS

NSUSN has grown organically since its opening. With minimal resources, the UBI has operated to help launch, grow, and support the entrepreneurs in the university. It has also helped the entrepreneurs to evaluate their ideas as they proceeded with their startups and choose not to continue with the businesses. So, entrepreneurs leaving the incubator without growth, successfully mitigated some risk before investing too much of resources personally was made into an idea that was either not feasible or not yet ready to be launched. Furthermore, NSUSN has enabled university faculties and students to accomplish their desire to share their time, skills, and knowledge for benefiting the business community on a whole. NSUSN as a business incubator is still small and matches with the current goals of the university. In the future, NSUSN will have opportunities to increase the funding network as per requirements of the businesses to support its members and to continue building the connection between students and regional entrepreneurship. Most importantly, this paper sheds light on the fact that even with minimal funding and limited number of resources, formation of an efficient university business incubator is possible.

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