



Infrastructure-Led Economic Transformation: Evidence from the Impact of the Padma Bridge on the Local Economy, Supply Chains, and Agriculture in Sreenagar Upazila, Bangladesh

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HOW TO CITE

Himel, F. A., Bithe, N. N., Islam, M., & Hasan, M. R. (2026). Normalizing online harassment: Perceptions, tolerance, and coping strategies among female university students. *Development Compilation*, 19(1), 75–88. <https://bips.bd/journal>

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ARTICLE HISTORY

Received: 23 June 2026

Revised: 09 July 2026

Accepted: 13 July 2026

Available online: 20 July 2026

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4.0**

Abstract

This study examines, the impact of the Padma Bridge on the local economy, supply chain and agricultural sector in Sreenagar Upazila of Munshiganj District of Bangladesh. The main objective of the study was to determine how improved communication led to improved business performance, increased revenue, and improved market linkages. The study uses inputs from four hundred respondents, including farmers, businessmen and small entrepreneurs. The study uses OLS method to analyse data. According to the findings, a positive correlation of income, reduced transportation costs and better communication, made the local supply chain more efficient and increases market access. The study found that 70% of merchants experienced an increase in sales and 43% an increase in revenue after the opening of the bridge. Local infrastructure however created new challenges for the markets. The study concluded that the Padma Bridge acts as an economic catalyst, which accelerates business diversification and agriculture. To ensure long-term sustainable development, it is necessary to develop skills, financial support for small and medium entrepreneurs and adopt policies. In substance, the study shows that the Padma Bridge, a large infrastructure project, can play an important role in the growth of the local and national economy.

Keywords: Padma Bridge, local economic development, supply chain, market access, agricultural development.

1. Introduction

The Padma Bridge, inaugurated in June 2022, is one of Bangladesh's most significant infrastructure projects, providing the first direct road connection between Dhaka and the country's south-western region (Islam, 2025). By linking Munshiganj with Shariatpur, Madaripur, and surrounding districts, the bridge has substantially improved connectivity for 21 districts, reduced travel time and transportation costs, and strengthened access to Mongla Port (Shoulin et al., 2024; SM, 2025). Improved transport infrastructure enhances the movement of goods and services, increases market accessibility, and improves supply chain efficiency, thereby creating new opportunities for businesses and agricultural producers (Mahmud et al., 2024; Bliznashka et al., 2021; Talukdar, 2024). As Bangladesh strives to achieve the Sustainable Development Goals (SDGs) and upper-middle-income status, understanding the local economic impacts of large-scale infrastructure investments has become increasingly important. Improved connectivity can reduce trade costs, stimulate entrepreneurship, strengthen agricultural marketing systems, and promote inclusive regional development (World Bank, 2023). These benefits are particularly relevant for rural communities, where improved market access can enhance livelihoods, reduce poverty, and create new economic opportunities for farmers and small entrepreneurs (Shoulin et al., 2024).

Sreenagar Upazila of Munshiganj District has experienced substantial changes following the opening of the Padma Bridge. The local economy depends heavily on agriculture, small businesses, and trading activities, all of which rely on efficient transportation and market connectivity. Despite the strategic importance of the bridge, limited empirical evidence exists on its effects on local businesses, supply chains, agricultural marketing, and household income in this area.

This study addresses this research gap by examining the economic impacts of the Padma Bridge in Sreenagar Upazila. Specifically, it aims to: (i) assess the bridge's contribution to local economic development, and (ii) examine its effects on business performance, supply chain efficiency, and market access. The study is guided by the following research questions: (a) How has the Padma Bridge influenced the local economy of Sreenagar Upazila? and (b) How has improved connectivity affected business activities, supply chains, and market accessibility? The findings provide empirical evidence to support infrastructure policy and regional development planning in Bangladesh.

2. Literature Review

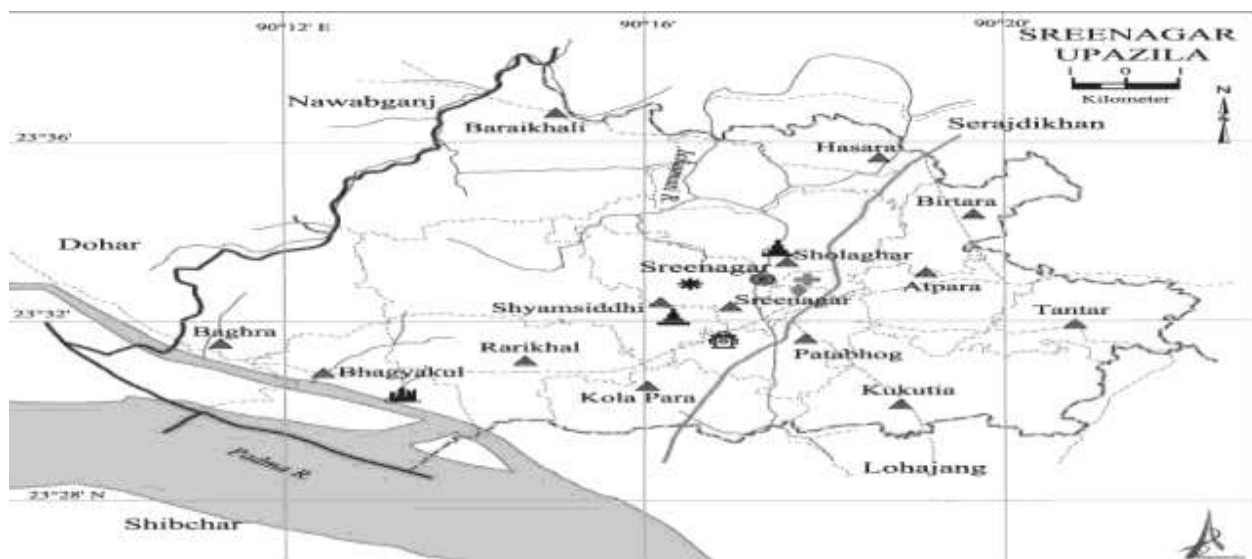
Previous studies have highlighted the significant role of the Padma Bridge and transport infrastructure in promoting economic development by improving connectivity, market access, and supply chain efficiency. Hawlader et al. (2024), based on a review of 33 studies, reported that the Padma Bridge has significantly reduced travel time, increased trade and investment, created employment opportunities, strengthened local supply chains, and contributed to long-term GDP growth while supporting the Sustainable Development Goals (SDGs) and the Trans-Asian transport network. Similarly, Ali et al. (2022) found that the bridge has enhanced regional connectivity and mobility, contributing to approximately 2.5% GDP growth in the south-western region and reducing poverty by 1.01% regionally and 0.84% nationally. Sourav et al. (2023), using

data from 614 respondents, found that the Padma Bridge improved transportation efficiency, increased bus services, and enhanced market accessibility in the Barishal Division, although it negatively affected passenger ferry services. Likewise, Andrianto et al. (2024) showed that improved transport infrastructure reduces transportation costs, increases market accessibility, and enhances business productivity and local supply chain performance through quantitative regression analysis. Gore (2024) emphasized that resilient local supply chains require overcoming structural, logistical, and geopolitical challenges. Oke et al. (2023), through an analysis of 84 case studies, argued that effective logistics and supply chain management are essential for achieving the Sustainable Development Goals (SDGs), although limited supply chain visibility often reduces operational efficiency. Similarly, Sukanta et al. (2020) reported that inefficiencies at Chittagong Port increase transportation costs and delays, creating additional burdens for import and export businesses. Rahman and Kobir (2022) examined the sustainable construction and management of the Padma Bridge and found that the project increased Munshiganj's GDP by approximately 1.2% while improving employment, transportation, market access, and agricultural production. Despite these contributions, the existing literature primarily focuses on the national and regional economic impacts of the Padma Bridge. Limited attention has been given to its micro-level effects on local businesses, household income, market accessibility, agricultural development, and supply chain performance in Munshiganj District. This study addresses this research gap by examining how Padma Bridge has influenced local economic activities, business growth, and supply chain development in Sreenagar Upazila.

3. Methodology

3.1 Study Area

Most existing studies on the Padma Bridge examine its economic impacts from national or regional perspectives, with limited attention to its localized effects. In particular, there is a lack of empirical evidence on how improved connectivity has influenced local businesses, agricultural activities, supply chains, and market access at the upazila level. This study addresses this gap by focusing on



Sreenagar Upazila of Munshiganj District Sreenagar is one of the six upazilas of Munshiganj

District and comprises 14 unions and 147 villages. It is bordered by Nawabganj and Sirajdikhan to the north, Sirajdikhan and Lauhjong to the east, Dohar and Nawabganj to the west, and Lauhjong Upazila and the Padma River to the south. Owing to its strategic location and agriculture-based economy, Sreenagar provides an appropriate setting for examining the local economic impacts of the Padma Bridge.

3.2 Sample Size:

The study follows following strategy to determine the sample size:

Sample size equation,
$$n = \frac{N}{1+N(e)^2} \text{ where,}$$

n = Sample size;

N = households existing or population size;

e = Level of precision

In our study, N = 2,93,905 population

(Source: According to Sreenager upazila parishad office (2022))

Figure 1: Map of study Area

e = 0.05.

Now calculated the sample size,
$$n = \frac{2,93,905}{1+2,93,905 (0.05)^2} = 399.45 \approx 400$$

Therefore, the sample size is 399.45, overall, 400 respondents for this study.

4.

3.3 Data Collection

Primary data were collected through face-to-face interviews between 1 April and 25 July 2025 using a structured questionnaire. The questionnaire was initially prepared in English and translated into Bangla to ensure respondents' understanding. A pilot survey was conducted to identify ambiguous questions, improve wording, and refine the sequence of items before the final survey.

The questionnaire consisted of three sections: (i) respondents' socio-demographic characteristics, (ii) local business and supply chain activities, and (iii) agricultural production and market access. Two trained enumerators conducted the interviews between 11:00 a.m. and 4:00 p.m.

3.4 Data Analysis

After data collection, the questionnaires were checked for completeness and consistency. The data were coded, entered into Microsoft Excel, and analysed using STATA 12.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' characteristics and key variables. In addition, an Ordinary Least Squares (OLS) regression model was employed to examine the effects of the Padma Bridge on local economic outcomes, business performance, supply chain efficiency, and market access.

3.5 Model specification

The Ordinary Least Squares (OLS) regression model is one of the most widely used techniques in econometric analysis for examining the relationship between a dependent variable and multiple explanatory variables. Under the Gauss–Markov assumptions, OLS produces the Best Linear Unbiased Estimator (BLUE), providing unbiased and efficient coefficient estimates (Wooldridge et al., 2016).

OLS is appropriate for this study because the objective is to examine the relationship between household income and several explanatory variables, including education, business type, transportation, and market conditions, using cross-sectional household survey data. The model assumes a linear relationship between the dependent and independent variables and provides coefficients that are straightforward to estimate and interpret (Greene, 2008).

Moreover, OLS minimizes the sum of squared residuals, ensuring the best-fitting regression line for the observed data. Its assumptions can be assessed through standard diagnostic tests, making the model suitable for empirical analysis. Due to its simplicity, reliability, and widespread application in socio-economic and micro-level impact studies, OLS is an appropriate analytical technique for this research (Stock & Watson, 2015).

$$\text{Model: } \ln(y_i) = \beta_0 + \beta_1 \ln(x_{1i}) + \beta_2 \ln(x_{2i}) + \beta_3 \ln(x_{3i}) + \beta_4 \ln(x_{4i}) + \beta_5 \ln(x_{5i}) + \beta_6 \ln(x_{6i}) + \beta_7 \ln(x_{7i}) + \mu_i \dots \dots (1)$$

Y_i = Income (monthly in Bangladeshi taka)

β = Unknown parameter to be estimated

X_{1i} = Education (Years of education are a measure, higher education is expected to positive income level.)

X_{2i} = Income source (Respondent earning such as business, agriculture, or service diversification of income sources is expected to increase household income.)

X_{3i} = Types of business (Respondent business, as like retails, manufacturing, agriculture etc. types varying income potentials)

X_{4i} = Product sell (Respondent report sales volume or change product sell, increased sales are expected to positive affect in income.)

X_{5i} = Transportation (access to transport facilities, reducing travel time, and cost change)

X_{6i} = Impact of revenue (Change to earning to income, due to revenue improve connectivity and higher revenue is expected to directly increase income.)

X_{7i} = Market competition (Competitor of market, local market; competition both positive and negative effects on depend income and market structure.)

4. Result

4.1 Descriptive Statistics:

The 400 variables used in the study are observed to create the overall report. Table 1 displays variables like education, income source, business type, product sales, transportation costs impact on revenue and market competitiveness. Each variable lowest and highest values are represented

by the mean and standard deviations. The education has an average of 1.548 and an average deviation of 0.806. 4 is the highest number and 1 is the lowest. In the field of income sources, can be observed that have an average value of 1.825, viewed simultaneously. The average value of the revenue is 0.433 the standard deviation is 0.496 the highest value is 1 and the lowest value is 0. Thus, a binary variable is employed in this case. Lastly the market competition highest value is 4 the lowest value is 1 the average value is 2.578 and the deviation is 0.718.

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Education	400	1.548	.806	1	4
Income Sources	400	1.853	.915	1	5
Type of Business	400	2.34	1.064	1	5
Income	400	17192.5	6422.505	8000	32000
Product Sell	400	.7	.459	0	1
Transportation	400	1.825	1.099	1	4
Impact of Revenue	400	.433	.496	0	1
Market competition	400	2.578	.718	1	4

Source: Author Estimation 2025

4.2 OLS Estimation

In addition to the more model parts shown as special, R-squared, F-test, AIC, BIC each also explains the appropriate values. The table 2 coefficient of this variable in education is 2076.935 and its standard value is 385.14. The t value is 5.39 and the p value is 0. This then indicates that the learning variable has a very strong correlation with income.

The standard value is 341.757 and the coefficient in the area of the source of income is -1548.539. The p value is 0 and the t value is 4.53. The income source variables value has a negative correlation when the coefficient is negative. The result explains a significant portion of the much larger with the source of income and is comparatively larger than the size of the coefficient. In the business type field, the t value is -2.92 the p value is 0.0004 the standard value is 295.745 and the coefficient is -862.898. The type of business appears to account for a substantial portion of the income variance as indicated by the coefficients negative value and the standard deviations small value.

Table 2: Estimate OLS Model

The coefficient of the revenue impact variable is 1327.008, the standard deviation is 633.738, the t value is 2.09, and the p value is 0.037. As a result, its value indicates that the impact of revenue with income is moderate. The t value is relatively strong, which makes its value reliable.

According to this model the dependent variables mean is 17192. 500 and its standard deviation is 6422. 505. These figures show that the samples differ by roughly Tk 6422 and the average income is approximately Tk 17192. The independent variables can account for roughly 24. 2 percent of the change in income according to the models R squared value of 0. 242. The Prob F value is 0 and the F test value is 17. 832 indicating that the independent variables have a significant impact on the change in income. The Bayesian information criterion (BIC) is 8085. 557 while the Akaike information criterion (AIC) is 8053. 625. These two indicators compare and evaluate the model.

income	Coef.	St.Err.	t-value	p-value	Sig
education	2076.935	385.14	5.39	0	***
Income source	-1548.539	341.757	-4.53	0	***
Types of business	-862.898	295.745	-2.92	.004	***
Product sell	919.817	653.997	1.41	.16	
transportation	-153.152	264.518	-0.58	.563	
Impact of revenue	1327.008	633.738	2.09	.037	**
Market competition	-590.472	434.465	-1.36	.175	
Constant	19449.933	2019.275	9.63	0	***
Mean dependent var	17192.500		SD dependent var	6422.505	
R-squared	0.242		Number of observations	400	
F-test	17.832		Prob > F	0.000	
Akaike crit. (AIC)	8053.625		Bayesian crit. (BIC)	8085.557	

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Author Estimation 2025

4.3 Multicollinearity Test:

The multicollinearity test is used to determine if the independent variables in the regression model exhibit multicollinearity. Multicollinearity is the term used to describe the correlation between two or more independent variables. The results of statistical tests and lower the accuracy of regression coefficients. In the table 4 the values of each variable VIF and $1 / VIF$ are given. Here the value of VIF is given that how much value of regression is increasing due to multicollinearity. Generally, if the VIF of a variable is higher than the normal value more than 10, then there is a multicollinearity problem.

The widely accepted that econometric literature (Gujarati, 2012; Wooldridge, 2016) where VIF value greater than 10 including serious multicollinearity issues.

The result shows that the value of VIF is between 1.06 and 1.24 and the average VIF is 1.19 the value is below 10. Also, find that the values of all the variables in our $1 / VIF$ are also close to 1, which is more tolerant of each variable.

Table 2: Test of Multicollinearity

Variable	VIF	1/VIF
Types of business	1.24	0.805932
Impact of revenue	1.24	0.807622
Income source	1.23	0.815590
Market competition	1.22	0.820562
Education	1.21	0.828588
Product sell	1.13	0.886359
Transportation	1.06	0.944733
Mean VIF	1.19	

Source: Author Estimation 2025

4.4 Heteroskedasticity Test:

Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity This test is mainly used to check whether the variance is constant or not in the regression model. The null hypothesis is the variance constant of the model there is no heteroscedasticity in the model. The values of income used in this test. The result table 5 shows that the value (chi2) is 1.57 and the value of prob > chi2 is 0.2104.

Here the p value indicates what is the probability of getting this kind of chi-squared value if the zero value is true. If the P value is too low (below 0.05), it means that there is heteroscedasticity. But if the p value is relatively high then its value will be considered acceptable. These results indicate that the test checks whether the variance of the model is constant.

Table 3: Test of Heteroskedasticity

Test name	Chi2	Prob>chi2	Decision
Breusch-Pagan/Cook Weisberg	1.57	0.2104	Constant variance

Source: Author Estimation 2025

5. Discussion

The findings indicate that the Padma Bridge has positively influenced the economic activities and supply chain of Sreenagar Upazila, Munshiganj. These results are consistent with previous studies showing that the bridge has strengthened economic integration between the south-western and central regions of Bangladesh by reducing travel time, improving market access, and narrowing regional disparities.

The regression analysis shows that education has a significant positive effect on household income ($\beta = 2076.935$, $p < 0.001$). This suggests that an additional level of education increases monthly income by approximately Tk. 2,077. The result supports Human Capital Theory, which argues that education enhances individuals' skills and productivity, enabling them to take advantage of new economic opportunities created by infrastructure development (Becker, 1975). In Sreenagar, improved connectivity with Dhaka has enabled educated individuals to participate more actively in urban labour markets, wholesale trade, and modern supply chains. Similar observations have been reported by Haque (2021), who argues that the Padma Bridge has generated both economic and social returns by expanding employment and market opportunities.

The coefficient for product sales is positive ($\beta = 919.817$) but statistically insignificant ($p = 0.16$). Although the immediate effect is not statistically significant, the positive coefficient and descriptive findings suggest that improved transportation and market access have increased trading activities. This indicates that the economic benefits of the bridge are emerging gradually and are likely to become more pronounced as regional markets continue to expand (Banerjee et al., 2020). This finding is consistent with Logistics Efficiency Theory, which states that improved connectivity and lower transport costs increase business efficiency and revenue over time (Rodrigue et al., 2020). Similar improvements in small traders' income following transport infrastructure development have also been reported by Haque (2021).

The coefficient for market competitiveness is negative ($\beta = -590.472$, $p = 0.175$), indicating that increased competition has slightly reduced individual income, although the relationship is not statistically significant. Improved connectivity has attracted new businesses and traders, increased market competition and reducing profit margins for some existing enterprises. However, this short-term adjustment is expected to encourage greater efficiency, innovation, and business modernization in the long run, as suggested by Market Competition Theory (Stiglitz & Greenwald, 2014). Therefore, while some businesses face temporary pressure, increased competition is likely to strengthen the local economy over time.

The Padma Bridge has brought significant structural changes to the economy of Sreenagar Upazila by improving connectivity with Dhaka and other major economic centres. Reduced travel time and transportation costs have increased the movement of goods, labour, and services, strengthening local supply chains and expanding market opportunities. Descriptive statistics indicate that the average household income has increased by approximately 40% compared with the pre-bridge period, highlighting the contribution of transport infrastructure to income generation, lower transaction costs, and greater market integration. These findings are consistent with the infrastructure-led growth model proposed by Calderón and Servén (2014).

The benefits have been particularly evident in the service, transport, and retail sectors, where businesses have responded quickly to improved accessibility. Small logistics operators, transport services, and retail enterprises reported noticeable growth in business activities, supporting earlier

findings that infrastructure investments generate faster returns in service and trade-related sectors than in capital-intensive industries (Donaldson, 2018). However, the gains have not been distributed equally across all business types, indicating that some sectors require more time and investment to fully benefit from improved connectivity.

Improved transportation has also strengthened the agricultural supply chain. Farmers can now transport perishable products to wholesale markets in Dhaka within a few hours, reducing post-harvest losses and responding more effectively to market demand. Although the transportation variable was not statistically significant in the regression model, the descriptive findings suggest that transportation influences income indirectly through better market access and increased product sales. This reflects the concept of the **connectivity dividend**, whereby transport infrastructure creates economic benefits through improved market integration rather than direct income effects (Iwasaki, 2011).

The findings further indicate that the Padma Bridge has improved the efficiency of local supply chains by reducing logistics costs and delivery time, particularly for perishable goods and time-sensitive trade. Approximately **70% of respondents** reported an increase in product sales, while **43%** experienced higher household income after the bridge became operational. Traders in Sreenagar can now procure raw materials from Dhaka and nearby districts and complete deliveries within the same day, which was difficult before the bridge. These improvements are consistent with the logistics efficiency framework, which emphasizes that lower transport costs enhance supply chain reliability and business performance (Rodrigue et al., 2020).

Despite these improvements, the full benefits of the bridge have not yet been realized. The insignificant coefficient of the transportation variable suggests that complementary investments in rural roads, storage facilities, and cold-chain infrastructure remain necessary to maximize supply chain efficiency. Similar observations have been made by Henderson and Shelley (2023), who argue that supporting infrastructure is essential for translating major transport investments into sustained regional development.

Market competition has also intensified following the bridge's construction. The entry of new traders has encouraged local businesses to modernize their operations by adopting digital payment systems, expanding inter-district trade, and improving business practices. Increased road connectivity has strengthened coordination among farmers, traders, wholesalers, and urban supermarkets through contract farming and more efficient distribution networks (Porter, 2001; Reardon et al., 2019). As a result, Munshiganj has become an increasingly important supplier of agricultural products, particularly perishable foods, to the Dhaka metropolitan market.

In the long term, the Padma Bridge is expected to drive structural transformation in the economy of Sreenagar Upazila through urbanization, industrial clustering, and the expansion of agro-processing industries. Economic geography suggests that large transport infrastructure promotes industrial concentration, increases land values, and stimulates regional economic growth (Alumni et al., 2013). Given Sreenagar's strategic location near Dhaka and the south-western transport corridor, the area has strong potential to become a logistics and agro-processing hub. The significant positive relationship between education and income further indicates that human capital development will play an important role in improving business productivity and expanding economic opportunities.

Improved connectivity is also expected to encourage investment in storage facilities, warehouses, wholesale markets, and other supply chain infrastructure. According to the World Bank (2023), major

infrastructure investments can increase annual GDP growth by approximately **1–1.5%**, provided that complementary investments and supportive policies are in place.

However, achieving these long-term benefits requires an inclusive development strategy. The negative relationship between business type and income suggests that small entrepreneurs may struggle to compete without adequate access to finance, training, and market opportunities. Therefore, targeted policy interventions, including affordable credit, entrepreneurship training, and improved market access, are essential to ensure that the benefits of the Padma Bridge are distributed more equitably. Evidence from China's transport corridor development also demonstrates that local enterprises require institutional support to benefit fully from large infrastructure investments (Fan & Chan-Kang, 2005).

The bridge has also created new opportunities for agricultural development. Lower transportation costs and shorter travel times have encouraged farmers to diversify into high-value crops such as fruits and vegetables by improving access to urban markets and reducing post-harvest losses. Similar outcomes were observed along the Jamuna Bridge corridor, where farmers within 30 km of the bridge increased cash crop production by 25% within five years (Ali et al., 2019). A comparable transformation is likely to occur in Sreenagar as market integration continues to strengthen.

The strong positive relationship between education and income highlights that infrastructure alone cannot maximize economic benefits. Investments in education, vocational training, and skill development are equally important for enabling local people to take advantage of new employment and business opportunities. Improved connectivity has also enabled many residents to work in urban labour markets while continuing to live locally, contributing to a form of "partial urbanization" that improves livelihoods without requiring permanent migration (Haque, 2021).

Finally, although the Padma Bridge has generated substantial economic and supply chain benefits, future development should remain environmentally sustainable. Rapid urbanization, industrial expansion, and increasing commercial activities may place additional pressure on the rivers and agro-ecological systems of Sreenagar. Therefore, future planning should integrate environmental protection with economic development to ensure that the long-term benefits of the bridge are sustainable (Umetsu, 2022).

6. Conclusion

This study examined the economic impact of the Padma Bridge on local business growth, agricultural development, and supply chain efficiency in Sreenagar Upazila of Munshiganj District. Using primary data collected from 400 respondents, including farmers, traders, and small entrepreneurs, and applying descriptive statistics and the Ordinary Least Squares (OLS) regression model, the study assessed how improved connectivity has influenced local economic activities.

The findings indicate that the Padma Bridge has generated substantial economic benefits for the study area. Approximately 70% of respondents reported increased product sales, while 43% experienced higher household income following the bridge's inauguration. The bridge has improved market access, reduced travel time and transportation costs, strengthened supply chain efficiency, and created new opportunities for business expansion and agricultural commercialization. Regression results further reveal that education has a significant positive effect on income, highlighting the importance of human capital in maximizing the benefits of infrastructure development. However, increased

market competition has created challenges for some traditional businesses, indicating that the gains from improved connectivity are not distributed equally.

Overall, the study concludes that the Padma Bridge has acted as a catalyst for local economic transformation by promoting business diversification, improving agricultural marketing, and enhancing regional integration. While the short-term benefits are most evident in the trade, transport, and service sectors, the bridge also has strong potential to support long-term industrial development and sustainable economic growth. To maximize these benefits, policymakers should prioritize investment in education and skills development, improve access to finance for small and medium enterprises, strengthen agricultural supply chains, and expand complementary infrastructure such as rural roads, storage facilities, and logistics services. Such measures will help ensure that the economic gains from the Padma Bridge are inclusive, sustainable, and beneficial to all sections of the local population.

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