ASSESSING ECNOMICS OF MANUFACTURING INDUSTRIES AMONG CENTRAL REGIONS OF BANGLADESH WITH COMPREHENSIVE SHORT-RUN & LONG-RUN APPROACH

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ABSTRACT

Despite substantial economic growth, Bangladesh is still categorized as a developing country by the World Bank. A regional economy is comprised of diverse sectors, each with distinct economic potential so as manufacturing industrial development. Bangladesh's manufacturing industries, including textiles, ready-made garments, pharmaceuticals, leather goods, footwear, jute, chemicals, and food processing, significantly contribute to the country's economic development which mostly comprises regions like Dhaka, Narayanganj, Gazipur, Khulna, and Chittagong. This study seeks to evaluate the economic performance, growth potential, and employment trends of manufacturing outputs in the central regions Which include Dhaka, Narayanganj and Gazipur. The research findings indicate an inclination of the economy to experience expansion in non-basic sectors, such as retail and services, while temporarily reverting to basic activities, as evidenced by methodologies like the Location Quotient and Economic Base Multiplier. The long-run share-shift analysis indicates upward trends in the region's national share, industrial composition, and regional transition, with manufacturing remaining predominant. The economic base multiplier value varied throughout time, resulting in basic activities in 2002. Location quotients typically exceed 1, signifying a rise in basic activities. Rapidly expanding industrial trends, especially in manufacturing, are anticipated to exceed the projected 42.49% by 2031as Predicted by ETS. In addition, the paper examines the environmental and socio-economic repercussions of rapid industrialization, which pose challenges to sustainable development. This article presents recommendations derived from the findings and provides strategic choices for regional decentralization and the safeguarding of agricultural resources to foster sustainable industrial expansion. Consequently, it will tackle certain difficulties that facilitate the region's economic development in a balanced manner while ensuring the sustainability of its natural and agricultural resources,

Keywords: *LQ (Location quotient), Multiplier (k), Shift-share, Manufacturing Industries, ETS (Error Trend Smoothing)*

1. INTRODUCTION:

Bangladesh is a developing nation economically. Bangladesh persists in meeting the international standards for a "Underdeveloped country" instead of an "economically developing country," despite its most recent period of significant economic expansion. Over the past few decades, Bangladesh has become a lower-middle-income country according to the World Bank after seeing tremendous economic progress. A regional economy is comprised of diverse sectors, each with distinct economic potential. Any alteration to one of these sectors can have an impact on the economy's overall growth, and comprehending the relative advantages of these sectors is crucial for the region's decision-making process (Herath, September 25, 2013). The low salaries, favorable government policy, and relatively young population inspire rapid growth in the Textile and RMG sectors of Bangladesh, which constitute the major export-earning industries of the country. In the last decade, Bangladesh has emerged as a leading garment manufacturer and is now the second-largest exporter of ready-made garments in the world, after China. The pharmaceutical industry also contributes to the economy hugely, as it meets 98% of the local demand and exports its products to more than 150 countries.(Fernandes, 2008).

The RMG industry is currently considered to be a vital component of Bangladesh's industrial economy, implementing significant contributions to the country's GDP, foreign exchange profits, and employment creation. The main industrial zones of Bangladesh are Dhaka, Narayanganj, Gazipur, Khulna, and Chittagong (Sabur, 2012).

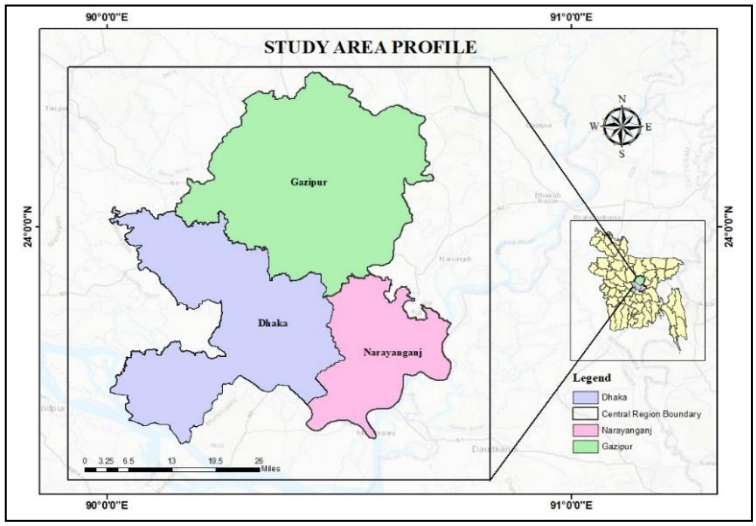


Figure 1: Study Area Profile

The Dhaka economy consists of two primary sectors: agriculture-based in rural areas and industry-based in urban regions, with significant non-farming activities. Narayanganj district is notable for jute merchandising and manufacturing, where mills and factories provide major employment and income. As the capital, Dhaka emphasizes secondary and tertiary economic activities. (Faisal, 2015). Dhaka, is a major manufacturing powerhouse. The largest sector is apparel manufacturing, with a large concentration of ready-made garment (RMG) factories in Dhaka, which account for over 80% of all exports from the nation (World Bank,2018). The industrial operations of the city encompass not just textiles but also plastics, electronics, and medicines. Dhaka has become an important economic hub for Bangladesh due to its quick industrialization and urbanization (Ahmed S. &., 2020). Narayanganj, which is one of the principal centres of Bangladesh's principal knitwear, garment, and textile industries, can be diversified into more value-added manufacturing industries and, therefore, be able to contribute to Bangladesh's economy and employment. (Abu Hanifa Md. Noma, 2016). Gazipur, located near Dhaka, is rapidly growing as an industrial zone due to its affordable land and the developing RMG industry. This growth will benefit Dhaka and Narayanganj, Gazipur, by diversifying their industrial base and investing in technology to increase production and diversify their industrial base.The shift share method of regional growth analysis is an analytical tool for comprehending the regional evolution of a national economy. The calculation of spatial shifts in economic activity is the primary function of shift share analysis. Since the analysis's official beginnings, it has been widely applied in the last 40 to 50 years in the domains of marketing, urban studies, political economics, geography, and regional economy (Herath, September 25, 2013, p. 2). Typically, the shift-share method used employment or gross

value add in statistics to measure change. With this approach, the contribution of the variables influencing local growth, the driving force behind national growth, and the particular combination of industries experiencing faster or slower growth than the national average is all continuously displayed (Goschin, 2014).

Similar to previous research, this study combines short-run and long-run approaches. The short-run strategy comprises the computation of Location Quotients (LQ) and Economic Base Multipliers. Fundamentally, the Economic Base Theory examines the key factors that influence changes in the local economy. It is achievable to determine the fundamental and non-basic activities driving the change using a variety of direct and indirect methods (Poinsot, February,2018).

This study examines the economic performance of the products of Bangladesh's Central Industrial Region, i.e., Dhaka, Narayanganj, and Gazipur. It attempts to find similarities and differences, quantify growth potential, and investigate employment patterns in short- and long-term approaches. The study is of greatest significance to understanding the economic situation of the region and its input towards Bangladesh's transition from a underdeveloped to developing country (The World Bank, 2022). The study addresses in a research void and offers stakeholders and policymakers insightful information.

2. METHODOLOGY

This study utilizes both short- and long-term analytical methods to evaluate regional growth trends. The short-run analysis uses the Location Quotient (LQ) approach to assess the concentration of regional employment in particular industries relative to the national average. The long-term research use Shift-Share research (SSA) to dissect regional employment development into national and regional components, emphasizing the influence of local industry strengths or weaknesses on the region's economic path.

2.1 Short-Run Regional Growth Calculation

Location Quotient (LQ)

In this analysis, regional economic growth is assessed using the Location Quotient (LQ) method, which has been widely recognized for evaluating short-run regional growth. The LQ for each industry in the study area is calculated by comparing the percentage of regional employment in an industry to the percentage of national employment in the same industry:

$$LQ = \frac{Percentage\ of\ Regional\ Employment\ in\ an\ Industry}{Percentage\ of\ national\ Employment\ in\ an\ Industry}$$

Table-1: Interpretation of LQ

Value of Location Quotients (LQ)	Interpretation
LQ > 1.00	The industry is producing more than is consumed locally (i.e., exporting)
LQ = 1.00	Local production meets local demand.
LQ < 1.00	Industry is producing less than is consumed locally (i.e., importing)

An LQ greater than 1 indicates that the region has a concentration of employment in that industry beyond what is needed for self-sufficiency, suggesting that the sector serves an export market. Conversely, an LQ of less than 1 indicates that the industry primarily serves local or non-basic needs. The number of surplus workers in export industries is calculated using the following formula

Basic Employment in Industry, $i = \frac{(LQ-1)}{LQ} \times E_i$

Where E_i represents regional employment in industry i.

Economic base multiplier (K):

Subsequently, the **economic base multiplier (K)** is calculated to measure the overall impact of basic industries on the regional economy. It is determined using the following formula:

$$K = \frac{Total\ Regional\ Employment (E_t)}{Total\ Basic\ Employment\ (E_b)}$$

(Source: Glasson, 1978)

2.2 Long-Run Regional Growth Calculation

For long-term growth, Shift-Share Analysis (SSA) is employed, a disaggregated approach that distinguishes regional growth by decomposing it into various components. The primary variable for this analysis is employment, and total regional employment growth is divided into two main components: the national share (NS) and the shift components.

National Share (NS) Component: The NS component measures how much the region's employment would have grown if it followed national employment trends. The equation is as follows:

$$NS_i = E_{j0}\left(\frac{E_t - E_0}{E_0}\right)$$

Where E_{j0} is the initial employment in sector j, and E_t and E_0 are the total national employment at time t and the base period, respectively.

Shift Component: This represents deviations in regional employment growth from national growth and is further divided into two parts:

- **Proportional Shift Component**: This measures the extent of employment growth attributable to the industrial composition of the region. It is calculated as:

$$PN_j = \sum\left(\frac{E_{it} - E_{i0}}{E_{i0}} - \frac{E_t - E_0}{E_0}\right)$$

- **Differential Shift Component**: This measures employment growth due to locational factors, capturing the difference in growth rates between industries in the region and the nation. The formula is:

$$DN_j = \sum\left(\frac{E_{ijt} - E_{ij0}}{E_{ij0}} - \frac{E_{it} - E_{i0}}{E_{i0}}\right)$$

By combining these components, Shift-Share Analysis provides a comprehensive view of how regional employment growth is shaped by both national trends and local industrial strengths.

3. RESULT AND DISCUSSION

3.1 Short-Run Change Analysis:

3.1.1. Trend Line Analysis

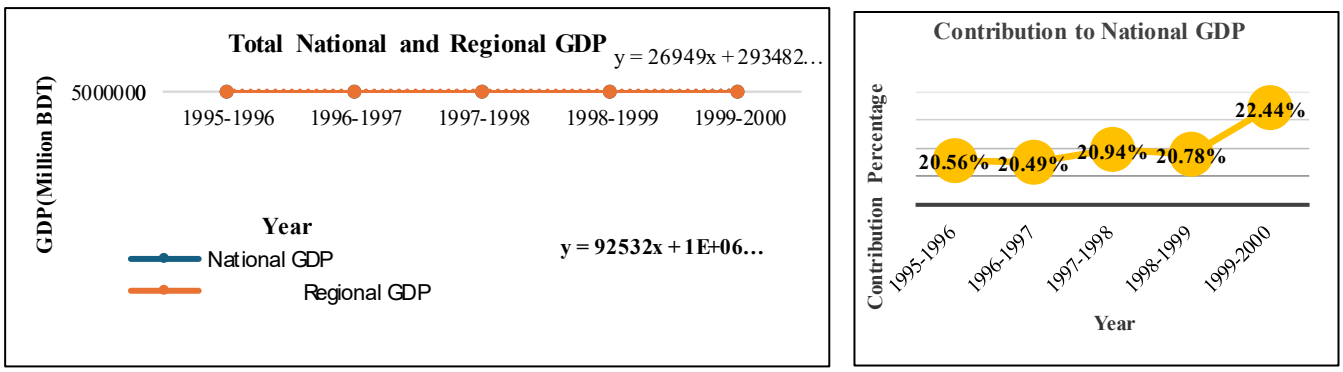


Figure 2: Trend line of Total National GDP & Contribution of Regional GDP to National GDP

(Sources: Author's preparation, 2024 based on BBS)

Between 1995–1996 and 1999–2000, Bangladesh's regional GDP grew by 34.76%, while the country's total GDP increased. The graph illustrates the steady increase in Bangladesh's national GDP from 1995-1996 to 1999-2000. Regional GDP also showed growth, peaking at 1995-1996 and 1999-2000. Contributing factors include heightened economic activities, infrastructure development, agriculture and industrial sector growth, rising investments, and increased productivity. The graph illustrates the steady increase in Bangladesh's national GDP from 1995-1996 to 1999-2000. Regional GDP also showed growth, peaking in 1995-1996 and 1999-2000. Contributing factors include heightened economic activities, infrastructure development, agriculture and industrial sector growth, rising investments, and increased productivity. (DebapriyaB, 2022). The right graph shows the percentage contribution to a country's GDP from 1995-1996 to 1999-2000. The highest percentage was recorded in 1999-2000 has gone up by 22.44%, which is quite an accomplishment (Islam, 2012). Overall service sector has grown, whereas the agriculture sector has declined, which is why GDP contributions have fallen up over the years.

3.1.2. Interpretation of Economic Base Multiplier & LQ with the Projection:

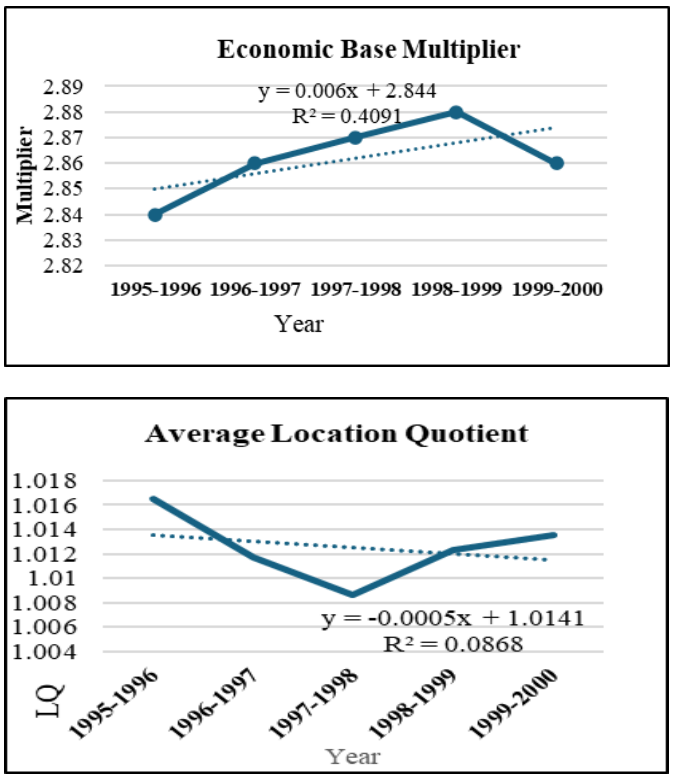


Figure 3: Trend line Economic Base Multiplier & Average LQ

The economic base multiplier in Bangladesh, reflecting growth in both the basic and non-basic industries, has been between 2.84 and 2.88, reflecting thereby the shift towards the non-basic sectors. A minor increase has occurred between the periods 1995-1996 and 1996-1997, with the highest non-basic shift in 1998-1999 due to unprecedented floods. However, during the year 1999-2000, there was a downtrend in the multiplier, influenced by growth in the basic industries. Dhaka's economic growth is largely driven by Foreign Direct Investment (FDI), particularly in manufacturing, thanks to government incentives and a favorable investment climate, with the apparel and textile sectors receiving the most significant FDI during this time period (AzizRkhan, Sep-dec 1995). The trend for LQ showed a downward movement from 1995 to 2000, especially in the years 1996 and 1998, likely due to the fact that the 1998 floods would have disrupted commodity markets, credit, and labor markets and destroyed facilities. This notwithstanding, the RMG sector grew in 1998-1999, helping exports touch 5,752 million USD and remittances reach an all-time high of 1,705.74 million USD,

thus helping to recover from the floods. Its increase implies the increase in simple activities. (Ahmed S. &., 2020).

3.1.4 Forecasting of regional GDP:

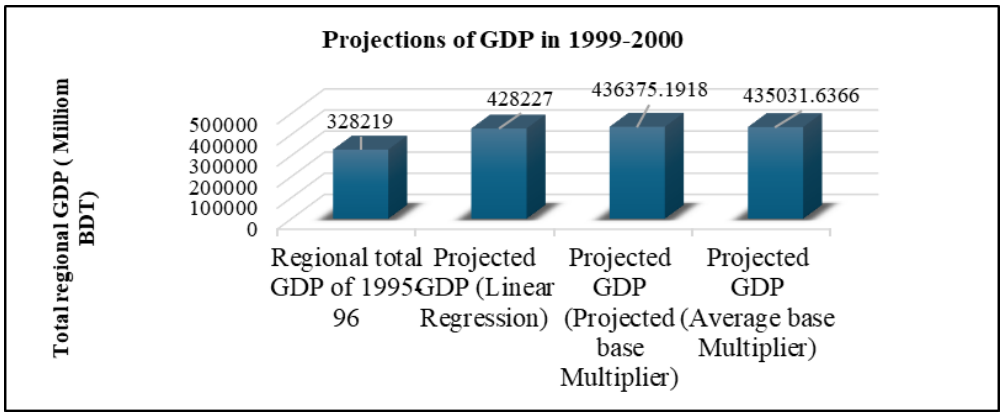


Figure 4: Projections using different methods

Table 2: Forecasting and projection analysis

Year	Forecasting Method	Forecasted GDP (Million BDT)	R^2	Modal fit
1999-2000	Linear Regression	428227	0.93	0.0928
1999-2000	Projected base multiplier	436375	0.86	0.1085
1999-2000	Average Base Multiplier	435032	0.41	0.1064
2024-2025	**Y=26949*30+293482=1101952(Million BDT)**			

Here, Modal fit= (Actual Value-Predicted Value)^2/Actual Value^2

Estimates for 2024-25 (Figure-04) were derived using Linear Regression, Economic Base Multiplier, and Average Base Multiplier models. The Linear Regression technique provided the most accurate estimate with the highest R^2 of 0.98 and the lowest model fit value of 0.0928, predicting an amount of 11,011,952 million BDT.(Table-02).This was the preferred method because it can measure the variation in GDP.

3.1.5 Calculation of Contribution of Regional Basic GDP:

Contribution percentage = (Change in Basic GDP per year/Change in Total regional GDP)

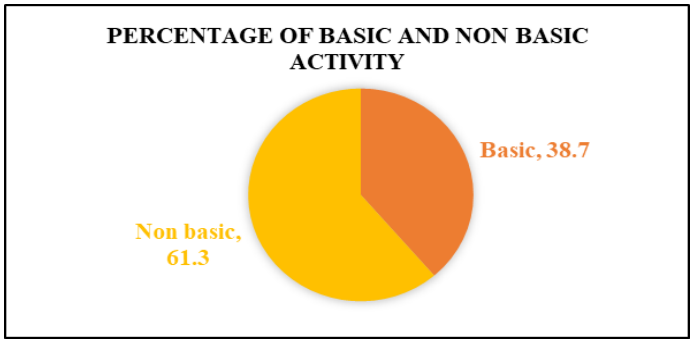


Figure 5: Percentage of basic and non-basic activity

In the above figure (5), the change in basic GDP per year was found to be 10438 whereas the change in total regional GDP was 26948, generating 38.7% of the basic activity overall.

3.2 Long Run Analysis:

3.2.1. Shift share Component analysis

Table-3 exhibits a favorable growth trend in the region with positive National Development Share (NS) and Industry Mix (IM) indices indicating potential for development at the national level. The positive Regional Shift (RS) component shows that the region's industries are doing better than the average for the region, which is an indicator of a quickly rising national economy.

Table-3: Forecasting of Regional GDP

Shift Share Components	**Magnitude/Value**	**Sign**
Region's National Share (NS)	77131.38	(+)
Region's Industry Mix (IM)	1056.546	(+)
Regional Shift (RS)	35904.99	(+)
Total Regional Growth (NS+IM+RS) =114092.91		

The share factors of structural change in Dhaka's industry are positive. The industrial mix is fast-growing, particularly in wholesale retail and construction have positive values. Dhaka's emergence as a regional commercial center has improved shift-share components, notably for sectors like electricity, gas, and water, which show positive magnitudes. (Morshed et al., 2022)

Table 4: Shift share Components of Different Sectors

SL	**Sector**	**(NS Sign)**	**(IM Sign)**	**(RS Sign)**	**Description**
1	Agriculture & Forestry	**(+)**	**(-)**	**(-)**	It has the potential to grow but is a nationally slow-growing & regionally lagging industry
2	Fishing	**(+)**	**(+)**	**(+)**	It has the potential to grow as a nationally fast-growing & regionally leading industry
3	Mining and Quarrying	**(+)**	**(-)**	**(+)**	It has the potential to grow which is a nationally slow-growing & regionally leading industry
4	Manufacturing	**(+)**	**(-)**	**(+)**	Same as 3
5	Electricity, Gas, Water	**(+)**	**(-)**	**(-)**	Same as 1
6	Construction	**(+)**	**(+)**	**(-)**	It has the potential to grow which is a nationally fast-growing & Regionally lagging industry
7	Wholesale and Retail trade	**(+)**	**(+)**	**(+)**	Same as 2
8	Hotel and Restaurant	**(+)**	**(+)**	**(+)**	Same as 2
9	Transport, Communication	**(+)**	**(+)**	**(+)**	Same as 2
10	Financial Intermediations	**(+)**	**(-)**	**(+)**	Same as 3
11	Real Estate, Renting, Business Activities	**(+)**	**(-)**	**(+)**	Same as 3
12	Public Administration and Defence	**(+)**	**(+)**	**(-)**	Same as 6
13	Education	**(+)**	**(+)**	**(-)**	Same as 6

14	Health and Social Works	(+)	(-)	(+)	Same as 3
15	Community, Social and Personal services	(+)	(-)	(+)	Same as 3

The table-04 indicates potential national growth in a specific industrial sector, with a positive Industry Mix score indicating rapid growth, often due to export-oriented industries. It also shows national and state industry growth rates, with a positive Regional Shift indicating a leading industry and a negative sign indicating a lagging one.

3.2.2 Identification of Regionally Leading, Lagging, Nationally Fast-Growing, and Slow-Growing Industries

Table (5) presents a clear identification of industries that are regionally leading or lagging based on their regional shifts, as well as those that are fast-growing or slow-growing at the national level. Understanding the variations in regional and national growth provides insight into industrial dynamics that can guide policy interventions and investment decisions.

Table 5: Identification of Regionally Leading, Lagging, Nationally Fast Growing, Slow Growing Industries

Regionally Leading Industry (RS +)	**Regionally Lagging Industry (RS –)**	**Nationally Fast-Growing Industry (IM +)**	**Nationally Slow-Growing Industry (IM –)**
1. Fishing 2. Mining & Quarrying 3. Manufacturing 4. Hotel & Restaurant 5. Transport & Communication 6. Financial Intermediations 7. Real Estate, Renting & Business Activities 8. Health & Social Works	1. Agriculture & Forestry 2. Electricity, Gas & Water 3. Construction 4. Wholesale & Retail Trade 5. Public Administration & Defence 6. Education	1. Fishing 2. Construction 3. Wholesale & Retail Trade 4. Hotel & Restaurant 5. Transport & Communication 6. Public Administration & Defence 7. Education	1. Agriculture & Forestry 2. Mining & Quarrying 3. Manufacturing 4. Electricity, Gas & Water 5. Financial Intermediations 6. Real Estate 7. Health & Social Works

(Sources: Author's preparation, 2024)

Industries such as **Fishing**, **Mining, Quarrying**, and **Manufacturing** have been identified as regionally leading in the study sectors. The non-core sector of fishing has also seen significant regional expansion in Narayanganj and Gazipur due to greater market linkages and infrastructure upgrades. (Rahman, Islam, & Khan, 2020). The garment sector and export-oriented industries have been responsible for driving manufacturing growth in Dhaka and Gazipur. The fishing, construction, wholesale, and hotel sectors are growing.

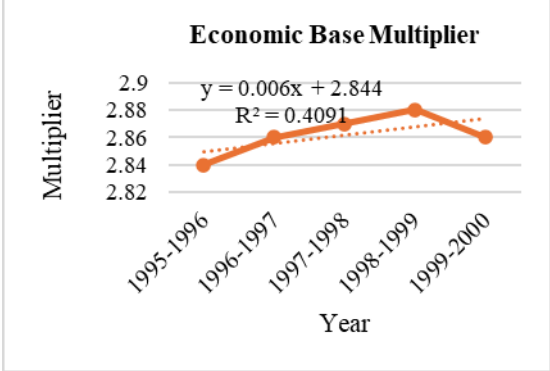
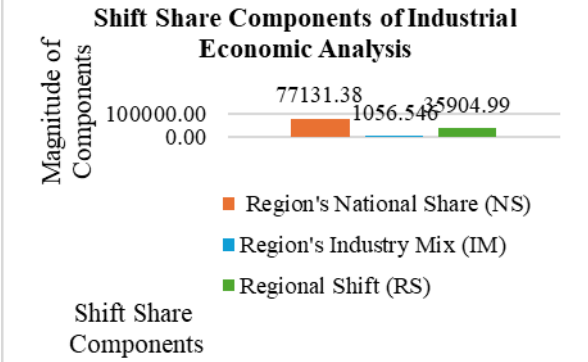
Table 6: Basic and Non-Basic industries in 1999-2000

Basic	**Non-basic**
Manufacturing	Agriculture & Forestry
Electricity, Gas, Water	Fishing
Wholesale and Retail trade	Mining and Quarrying
Hotel and Restaurant	Construction
Transport, Communication	Real Estate, Renting, Business Activities
Financial Intermediations	Education
Public Administration and Defence	Health and Social Works

(Sources: Author's preparation, 2024)

Table (6) identifies Dhaka, Gazipur, and Narayanganj areas in Bangladesh as basic and non-basic industries. The major economic drivers are manufacturing, electricity, gas and wholesale and retail trade. Industrial parks of Dhaka and garment factories of Gazipur contribute greatly to the growth of the nation. The districts have facilitated the provision of basic services like power and water, mostly because of natural gas; there is also a thriving wholesale and retail market. Agriculture, fishing, and forestry, as part of non-core activities, are lower in proportion because of resource limitations. Increased urbanization has brought about increased construction, real estate, and health-related services, making the economies of these districts more resilient. (Chowdhury & Ahmed, 2018). Table-4 displays the economic base multiplier trend line and shift-share component value. The multiplier's rise in the first fiscal year resulted in a decline in basic activity and an increase in non-basic activity. The trend line has remained consistent throughout all fiscal years, indicating a decline in basic activity and an increase in non-basic activity, possibly linked to sector theory's aggregate growth models. The theory suggests that a rise in primary activities leads to a rise in tertiary activities, indicating a shift from agriculture to service-oriented sectors, indicating economic progress. . Demand for production of goods produced by secondary and tertiary industries increases faster when income increases, leading to rapid growth of these industries.

Table 7: Comparison of Short-run and Long-run change

Short Run Change	Long Run change
	

(Sources: Author's preparation, 2024)

So, the region is moving forward from agricultural activity to manufacturing activity, from primary activities to tertiary activities. During this period (1995-1996 to 1999-2000), Bangladesh implemented various short-term economic policies to stabilize the economy. These included measures to control inflation, manage exchange rates, and stimulate economic growth which have been clearly depicted in the long run analysis (Rahman S. H., 2022). Again, the region exhibits potential for national growth (NS), as the favourable Industry Mix (IM) and positive Regional Shift (RS) components suggest that the industries are making contributions both regionally and nationally.

3.2.6 Comparison of yearly change of employment in different sectors:

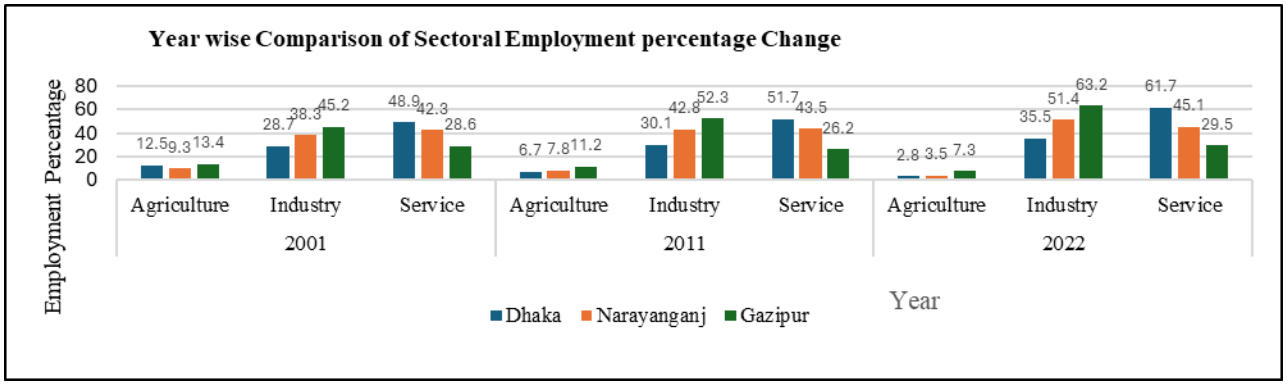


Figure 6: Employment sector comparison considering recent years

The chart (figure-6) shows from 2001 to 2022, employment percentages in industries, services, and agriculture sectors in Dhaka, Narayanganj, and Gazipur showed a decrease in agricultural employment due to urbanization and industrial growth. Gazipur was the fastest-growing district, with Dhaka's service industry employing more people than the industrial sector. The largest sector was apparel manufacturing, with a large concentration of ready-made garment factories.

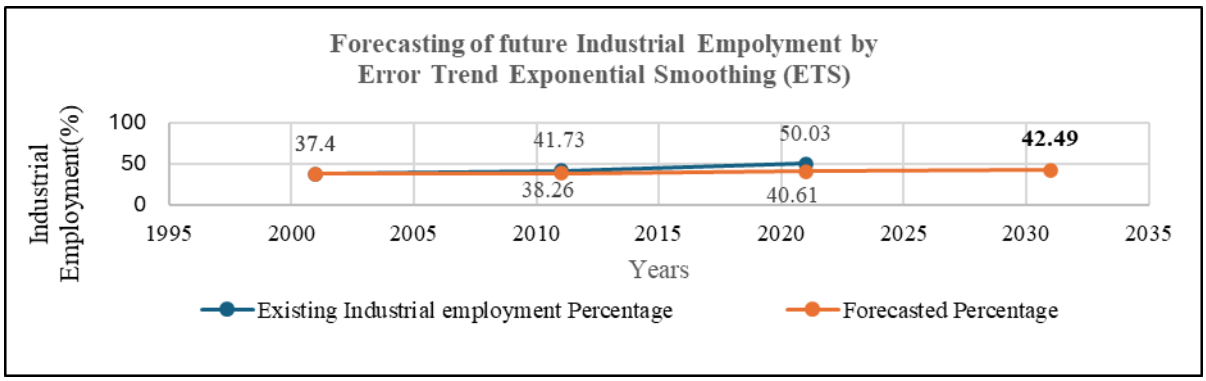


Figure 7: Forecasting of industrial employment

Here the function (Figure-7) which has been used is $\mathbf{F_{t+1}=\alpha\ (A_t) + (1-\alpha)\ F_t}$, Where F_{t+1} represents the forecasted value; F_t Represents the final forecasted Value; A_t represents the Actual Value and the value of α (Smoothing Factor) is taken as 0.2 or 20 %. ETS is a forecasting technique that breaks down time series data into three components: Error, Trend, and Seasonality. The employment data has increased from approximately 37.4% in the year 2000 to 50.03% in 2020 and was projected to increase further at a slow rate in 2031. This indicates a high increase in industrial employment, which is a sign of increased basic activities in the central region during the next years.

5. CONCLUSION

Bangladesh's primary industrial zone, including Dhaka, Narayanganj, and Gazipur, has experienced significant economic transformation over the years. The rapid industrialization, particularly in the manufacturing sector, has resulted in the rise in GDP on a short-term basis. However, the long-term growth has been good for all the chief components, including national share, industry mix, and regional shift. Manufacturing has been the driver of the growth, supported by infrastructural development and favorable regulations. However, rapid urbanisation has resulted in environmental degradation, deforestation, and agricultural land reduction, hindering sustainable development. To ensure sustainable development and balanced growth, strategic recommendations include decentralization, safeguarding agricultural land from urban encroachment, investing in modern technologies and infrastructure, incorporating sustainable urbanization into urban planning, and fostering growth in high-growth sectors like information technology, transport, and communication.

This will help Bangladesh progress in its economic path while preserving the environment and promoting equitable regional development.

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