

A Structural Model for Assessing the Factors Influencing the Demand and Supply of Skills in the Garment Industry of Bangladesh

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ABSTRACT

Purpose: It is essential to formulate and implement different policy frameworks for skills development in Bangladesh's garment sector, which may play an important role in Bangladesh's economic growth and sustainable development. That is why, in this study, the principal purpose has been made to formulate and estimate a structural model to identify the determinants of demand and supply of skills in the garment sector of Bangladesh to assess the needs of skilled workers in this sector as well as to find out the capacity of the training providers to bring out skilled graduates which may play an important role to formulate policies for sustainable development of the garment sector of Bangladesh.

Design/methodology/approach: This study is based on primary data. Primary information on different variables is collected using a structured questionnaire from 130 garment workers in four big cities: Chattogram, Dhaka, Gazipur, and Narayanganj. Stratified random sampling is used to collect the sample observations, considering each city as a stratum, and a part of the sample is drawn at random from each city. We select respondents from the client's list of beneficiaries through simple random sampling. Advanced-level econometric techniques are used to provide a lucid analysis.

Findings: From the χ^2 -test results it is found that different pairs of attributes, such as skills and wages, skills and education level, and skills and required quality, are associated in the garment sector of Bangladesh. From the final estimates based on the two-stage least squares method of the demand and supply functions of skills of the structural model, it is found that the effects of the variables, education level of the employees, yearly sales revenue of the factories, and the total investment of the factories have significant positive impact, on the demand of skills and the variables monthly cost of living of the workers has statistically significant positive effects and the variable wage rate of the competitive sector hurts the supply of skills in the garment sector of Bangladesh.

Originality/value: To the best of my knowledge, this study is a unique attempt to formulate and estimate a structural model of the demand and supply of skills in the garment sector of Bangladesh to assess the needs of skilled workers in this sector based on the primary data of several variables.

Conclusions: In this paper, a structural model is developed to assess the factors influencing the demand and supply of skills in Bangladesh's garment industry. This model can be used to formulate and implement different policy frameworks for skills development in Bangladesh's garment industry. Policies should be formulated based on the estimated results of the structural model. From the estimated results it is found that the variables, education level, expenditure for training programs, sales revenue and total investment play a significant positive role in the demand for skills in the garment sector of Bangladesh, therefore emphasis should be given to creating literate skilled workers, considering more expenditure for training programs, more investment in the garment sector, and the government and other stakeholders have to develop policy-frameworks to earn more sales revenue as a result the demand for skilled workers will increase. Since the variable wage rate of the competitive sectors plays a significant negative role in the supply of skills. Therefore, the government, including other stakeholders, have to take necessary measures to increase the wage rate of the garment sector of Bangladesh as a policy framework for the sustainable development of the garment sector; otherwise would be very difficult to find quality workers in the garment sector. As a result, the production function will be running as a decreasing return to scale for a long period. Therefore, it may work as a barrier to the development of the garment sector as well as for the national economy, and in future, this sector may happen like the Jute industry of Bangladesh.

Keywords: Sustainable Development, Primary Data, Structured Questionnaire, Skilled Workers, χ^2 -Test, Two-Stage Least Squares Estimates

Introduction

The garment sector of developing and least-developed countries plays an important role in economic growth and structural change from an agricultural-based economy to an industry-

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based economy and from an industry-based economy to a service-based economy. Over the last few decades, many Asian countries, especially China, Cambodia, India, Myanmar, Nepal, Thailand, and Vietnam, have increasingly implemented different policy frameworks for sustainable development regarding the garment industry and national economic growth. As an Asian country, Bangladesh is far beyond this. Thus, it can be said that the development strategy plays a significant role in changing the economic and socio-economic conditions of any country in the world. Therefore, after experimenting with a domestic demand-based import substitution strategy for nearly two decades, the country finally has made a development strategy for a more open market-based economy where the private sector would play an important role as a leader in the country's economic and socio-economic development. The development strategy has been playing a significant role in changing "the economic and socioeconomic conditions" of Bangladesh since the 1980s, like other countries. As a part of the development strategy, the reforms of liberal trade policies were introducing tariff reduction rates, reducing tariff slabs and the reduction of quantitative restrictions on a large scale, encouraging exports through various measures in different continents. As a result, "the economic condition and trade ratio" of Bangladesh are growing simultaneously at a faster rate. Due to liberal trade policies, the garment sector in Bangladesh is becoming the most dynamic sector to earn foreign currency.

The garment sector is the largest industrial sector in Bangladesh, which has occupied its foremost presence in the economy of the country in terms of the contribution to GDP, foreign exchange earnings, employment generation, poverty reduction and socio-economic development. We know that Bangladesh is the world's third largest exporter of garment products, with an average growth rate of export values, is of 24.90% (1976-2021). In 1976, the total export value of the garment sector of Bangladesh was nearly 0.069 million USD (Export Promotion Bureau); however, in 2021, it became about 30814.93 million USD, which is 446593.2319 times higher relative to 1976. The growth rate of total export value is 11.16% (1976-2021), which indicates that the growth rate of export values in the garment sector is 2.23 times higher than the growth rate of Bangladesh's total export value. In 1976, the total export value was 480.17 million USD (WDI), and in 2021 it became about 34931.95 million USD, which is 72.75 times higher than in 1976. The mean export value of the garment sector from 1976-2021 is 9948.289 million US\$, which is statistically significant at any significance level with a t-test value of 5.822. The export values of the garment sector some time and the total export values of Bangladesh over a period are graphed below in Figure 1.

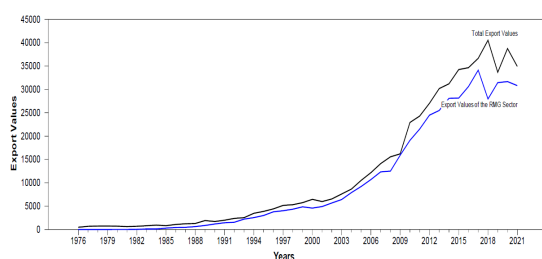


Figure 1: Export Values of the Garment Sector and Total Export Value in Million US\$

From Figure 2.1, it can be said that in Bangladesh, the export value of the garment sector is increasing rapidly, which occupies 88.21% of the total export value in 2021; however, in 1976, it occupied only 0.015%. From Figure 1, it can also be said that both variables have been increasing until 2019, but from 2020, they declined, which happened due to the COVID-19 outbreak. In 1976, the garment sector contributed 0.000279% of the total GDP, but now it has reached 16.01%, which is 57191.1438 times higher than in 1976. The mean value of the contribution from 1976-2021 is 8.079%, which is statistically significant at any significance level with a t-test value of 8.08. The yearly contributions of the garment sector to the total GDP are shown graphically below. Figure 2 indicates that the contribution of the garment sector to the total GDP declined in 2019, which happened due to the global impact of the COVID-19 outbreak, but from 2020, again, it started to increase. It is also found that the contribution of the garment sector to the total GDP has increased rapidly and significantly since 1976. Therefore, it can be said that the garment sector plays a significant role in the economic growth in Bangladesh, including other emerging and frontier economies. As a result, in the world, Bangladesh is one of the fastest-growing economies with an average growth rate of 4.76% in its Gross Domestic Product (GDP) (using the data from 1972-2021, constant 2015 US\$).

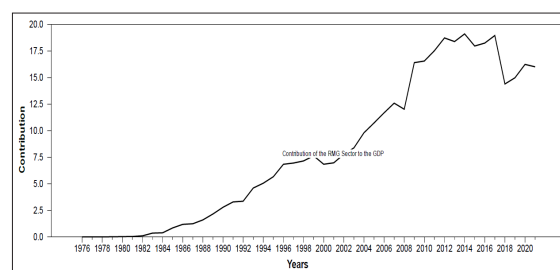


Figure 2: Yearly Contributions of the Garment Sector to the GDP of Bangladesh (in %)

In 1972, the GDP of Bangladesh was nearly 21475.76 million USD, and in 2021, it became about 192445.0 million USD, which is 8.96 times higher relative to 1972. It is the 29th largest economy among 39 countries in the Asia-Pacific region, and the 33rd largest economy in the world in nominal terms (World Bank, 2021). The average value of the GDP of Bangladesh is 77443.04 million US\$, which is statistically significant at any significance level with the t-test value of 9.953. The GDP (constant 2015 US\$) and its growth rate are shown below in Figures 3 and 4.

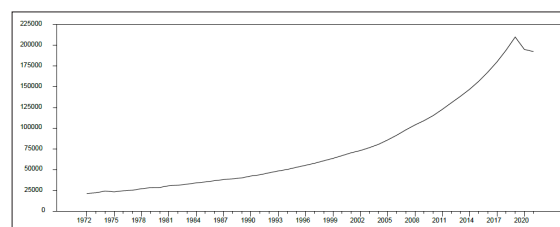


Figure 3: GDP (Constant 2015 US\$) of Bangladesh in Million US\$

Figure 3, shows that the GDP of Bangladesh has been increasing rapidly, but since 2020 it has been decreasing which is caused due to the COVID-19 outbreak.

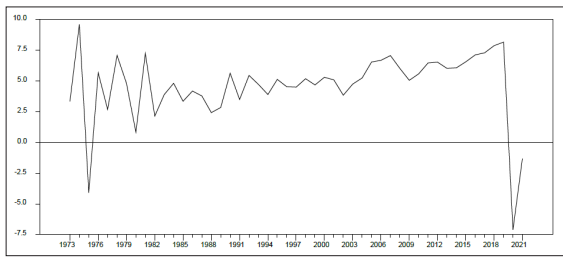


Figure 4: Growth Rate of GDP (Constant 2015 US\$) of Bangladesh

Figure 2 indicates that the yearly growth rate of the GDP of Bangladesh has been increasing rapidly since 1972, with an average growth rate of 4.62%, which is statistically significant at any significance level with the t-test value of 11.216. Figure 4, it shows that from 2019 to 2020, it declined due to the COVID-19 outbreak. Again, from 2020-2021, it has increased. Nowadays, skills development policies are important for sustainable development and economic growth and accelerate economic growth at a faster rate. The skills development policies play a significant role in creating quality human resources, which may play an important role in increasing labour intensity, including the productivity of capital investment on economic growth in Bangladesh. As a result, the economic growth of Bangladesh will increase at a faster rate, and socio-economic development will be sustainable. Still, the labour productivity in our economy is very low relative to other Asian countries, which is equal to 0.0272 with a p-value of 0.7325; this is not statistically significant. It was also found that the Bangladeshi economy is running with a decreasing return to scale, which is equal to 0.67 and smaller than other Asian countries (using the data set from 1980-2020). We must develop skills in all sectors for economic growth and sustainable development.

Over the last four decades, there has been a rapidly increasing trend of young individuals participating in the labour market of Bangladesh, especially in the garment sector, who have completed their school, college, and a higher level of education. This increasing trend has short-run and long-run effects on working after completing their education and future labour market opportunities. There is a concern that working in the garment sector after completing school or college may improve a young individual's organizational skills, a sense of responsibility, and self-esteem, which in turn are traits that may be rewarded in the labour market in future. Developing a credible institutional mechanism for skills planning is an important factor of the national skills development strategy and for the garment sector [1-5].

Nowadays, there is no institutional mechanism to provide credible information and analyses concerning the supply and demand for skills at the national level and for the garment sector in Bangladesh. There are differential information, databases and research initiatives, however, there is no standardized framework for determining skills supply, shortage and vacancies, and there is no integrated information system for skills supply and demand across the government, the BGMEA, BKMEA and other stakeholders. For economic growth and infrastructure development, better information and integration are very much needed in planning the university, vocational college, and skills sub-systems.

It is also very needed for knowledge-based education and planning instruments for the system, and research-based quality resource persons for strategic decision-making for the post-school system. Thus, policymakers need to develop strategies and pursue related investments which can play an important role in economic growth and the garment sector development in Bangladesh. The development of strategic policies must be guided by the availability of information and intelligence and include a forward-looking element. In the context of strategic policies or education policies, the role of information and intelligence is manifold, it is important to assess existing skill needs and to provide a longer-term perspective so that policymakers not only anticipate future requirements but can also actively shape them [6-10].

Based on the information and using forecasting, regular and systematic early warning systems are very important for policy development and other approaches. Skilled workers are a key part of the garment sector development, and for the national economy's infrastructure development and the right choices made by policymakers, enterprises and individuals on investment in education and skills work as a driving force for the garment sector and economic development. The systematic and scientific forecasts of demand and supply of skills in the garment sector from the education sector follow policy initiatives which give priority to anticipating changing skills needs in the garment sector due to globalization and technological and organizational changes, including economic restructuring.

Therefore, the government of Bangladesh is trying to implement different strategic policies for the development of national skills in different educational institutions. The garment sector is no exception to this wave of skills development, but still, it is not satisfactory. Many Asian countries, namely India, China, Vietnam, Myanmar, Cambodia, including Thailand over the last few decades have increasingly implemented different policy frameworks for skills development which works as a driving force for the development of industrial sectors which may cause economic growth and sustainable development. Still, Bangladesh is far beyond this. That is why, in this research work the principal purpose has been made to develop and estimate a structural model to identify the determinants of demand and supply of skills in the garment sector of Bangladesh to assess the needs of skilled workers in the sector as well as to find out the capacity of the training providers to bring out skilled graduates which may play an important role to formulate strategic policies for sustainable development in the garment sector of Bangladesh as well as for the national economy.

The manuscript is organized as follows. Section II presents a literature review; Section III discusses data collection, including the nature and source of data for empirical analysis; Section IV presents a methodology for data analysis, including descriptive and inferential techniques, econometric techniques, empirical analyses, and a discussion of results; and finally, section VI concludes with a summary of the main findings and policy implications [11-15].

Literature Review

A large number of theoretical and empirical works have been done regarding Bangladesh's garment sector. For example, Absar

conducted a study on the problems of wages in the garment sector of Bangladesh and found that the garment sector of Bangladesh got huge development in the world; however, the wage rate of the employees was not satisfactory level. Bhattacharya and Rahman (2001) carried out a study on growth trends and post-MFA challenges in Bangladesh's garment sector. They found, more than 1.5 million workers had increased in the garment sector and 70% of the total female workers in the country's manufacturing sector. Ahamed, conducted a study to find the impact of the garment industry on the livelihood pattern of the women garment workers in the Narayanganj District of Bangladesh. This study found positive changes in socioeconomic status and the livelihood patterns of the women garment workers. This study also examined the provisions of microcredit for women garment workers, which are considered to be an economic and social relief for self-employment to increase their income and improve their living conditions [16-20].

Mridula and Khan, conducted a study on the working conditions and productive health status of female garment workers in Bangladesh. In this study, most respondents were between 16 to 30 years old. This study found that most respondents reported a lack of awareness about occupational safety and health issues. A most dangerous finding of the study was that the female garment workers were not aware of their reproductive healthcare. This study also found that a maximum number of female workers reported several health-related problems associated with their working environment. The significant finding of this study was that most of the workers lived in slum areas with inhumane living conditions. Their salary is poor and sometimes not paid in due time. Chowdhury and Ullah, conducted a study on the socio-economic conditions of female garment workers in the Chittagong Metropolitan area. This study highlighted the conditions of female workers from two perspectives, one from a social perspective and another from an economic perspective. This study found that the standard of living of female garment workers was very poor and they were not free from the vicious cycle of poverty, and they were facing extreme difficulties to fulfil their basic needs to survive.

Bhuiyan, attempted to explore the socio-economic status of the garment workers in Bangladesh. This study was based on the social and economic status of 100 garment workers from Rampura and Badda areas of Dhaka city. This study found that 70% of the female workers worked from dawn to dusk even up to late at night but their wages were not satisfactory level. This study also found that the workers were not free from the vicious cycle of poverty and they were suffering at extreme levels to fulfill their basic needs. It was also found that they have no additional time or scope for recreation. Islam & Chowdhury, conducted a study on the socio-economic condition of garment workers in Bangladesh. This paper was an endeavor to highlight the conditions of the workers from the perspective of housing conditions, education, health and sanitation and services role of the female workers. The study highlighted that the living standards of the workers were poor, and they faced extreme difficulties in obtaining their basic needs to survive in society. Their study recommended that improvement is very much needed in some fundamental areas say housing conditions, education level, health and sanitation, and service role in favor of female workers. Ahamed, conducted a study on improving

social compliance in the garment sector of Bangladesh. This study found that the working conditions in the garment sector of Bangladesh, are poor and face challenges regarding social compliance. He also pointed out that fair labour practices and the government and entrepreneur's roles are needed for implementation [21-25].

Akter, conducted a study to assess the impact of female labour migration from rural to urban areas using the Sustainable Livelihood Approach (SAL). The study was conducted in Tongi and Gazipur Sadar under the Gazipur district. This study found positive changes in different livelihood assets financial capital, natural capital, social capital and decision-making. Ahmed, conducted another study on job dissatisfaction in the garment sector of Bangladesh. This study observed that satisfied workers are more likely to be hard workers, creative, flexible, innovative, dynamic, risk-takers and loyal to the industry. Khatun and Shamsuzzaman, conducted a study on job satisfaction in the garment sector of Bangladesh. This study focused on the working conditions of the employees and the failure of existing labour laws. This study found that the workers of the AKT group are satisfied with the working environment, health facilities and benefits of overtime. Farhana, et al., carried out a study on wages level, age group, gender, family life, living standard and working hours of workers in the garment sector of Bangladesh. This study found that the demand for garments in Bangladesh is very high in the international market, but the wage rate of the workers was poor. Their study recommended that improvement is very much needed in some areas like labour wages, compliance, business climate, trade logistics and skill level of the workers.

Akterrujjaman & Ahmed carried out a study to measure the level of satisfaction of the workers in the garment sector of Bangladesh. This study is based on 150 workers from 24 garment factories in Gazipur and Dhaka cities of Bangladesh. This study found that a maximum number of workers replied that they were not satisfied with their jobs. This study also observed that the garment factories in Dhaka and Gazipur cities were not so sincere in the case of workers' satisfaction. This study recommended that in increasing productivity and profitability garment manufacturers should give importance to the satisfaction of the garment workers. Mustafa, et al., carried out a study to document the socio-demographic profile of women workers in the garment sector and to assess the impact of employment in the garment sector on livelihood change. This study is based on two garment factories from Dhaka city and another two garment factories from Gazipur city and a sample of 60 women workers was selected. This study found that the employment opportunities of women workers in the garment sector of Bangladesh play a significant role in changing their socio-economic condition, and livelihood pattern, in case of decision-making and to provide education to their children. Rahman, et al., carried out a study on the growth, contribution and challenges of the garment sector in Bangladesh [26-30].

This study is based on secondary data. This study highlighted that the garment sector is the largest exporting industry that has experienced significant growth during the last 25 years. This sector, provided more than 5 million direct jobs, 16% of GDP and more than 81% of foreign remittances in FY2013-14. Osmani & Hossen (2018), conducted a study on the problems

of working women in the garment sector of Bangladesh. This paper highlighted that the problems faced by garment women workers are extreme. It may cause a serious threat to the development of Bangladesh's economy. This paper found that the major problems faced by garment women workers are salary discrimination due to gender, late salary payment, sexual harassment, mocking, no leave during pregnancy and sickness, inadequate medical facilities, housing problems, insufficient transportation of companies, the spread of various diseases and unhygienic workplace due to industrial discharges. The research asserts that if these problems persist and are not tackled effectively, the number of working women will gradually diminish; consequently, the economic growth of Bangladesh will stand far from its desired goal. Elahi, et al. (2019), carried out a study on comparative analysis before and after the Rana Plaza incident in the garment sector of Bangladesh.

This paper highlighted that after the Rana Plaza incident, different conditions in the garment sector of Bangladesh have changed due to the demand of the buyers, of the world including the working conditions, health & safety measurements, labour rights and wages of garment workers. This paper also pointed out that more investment in the human capital of the sector would be the key factor in the coming days. To secure more value addition companies must invest in human resources. If not then the garment sector full or a portion must be transformed into the world-class best-performing ones. Golam, conducted a study on the new minimum wage in the garment sector of Bangladesh. This study found that the new wage structure policy has not yet been implemented effectively. This paper also highlighted that a large number of workers including graded workers are receiving lower amounts than the amount approved minimum by the government. Hasan, conducted a study on minimum wage in the garment sector of Bangladesh. These studies found that the minimum wage varies across the country based on the nature of the industry. This paper highlighted that the garment sector of Bangladesh, is enjoying a clear price competitiveness against its competitors say: China, Vietnam or India. This paper also highlighted an increase in wages in the garment sector of Bangladesh does not ensure the well-being of the workers in their daily lives due to price hikes for all commodities [31-35].

It has been experienced that any announcement of a new pay scale, increases the prices of all commodities instantly. It is also experienced that the declaration of the national budget every year in the parliament automatically increases the prices of all products including essential commodities. As a result, the revision of wages of the workers in the garment sector in Bangladesh does not play any role in the well-being of their daily lives. Salam and Senasu carried out a study, on the development of the sustainable index for the garment sector in Bangladesh. They recommended that proper use of this index in the garment sector of Bangladesh could help the garment sector of Bangladesh to overcome the difficulties they face regarding sustainability. Bhattacharjee, carried out a study in Bangladesh: COVID-19 badly impacts the garment industry and found that cancellation of orders will be a big threat to the survival of this sector. Islam, K. M., carried out a study on the impact of COVID-19 on the garment sector in Bangladesh and this study is based on both primary and secondary data. This study found that due to COVID-19, orders of 3.18 billion \$ were cancelled.

This study also found that during COVID-19, the supply chain of raw materials was severely disrupted.

This study highlighted, that on July 2020, the exports of the RMG sector were 11.43% lower compared to the previous year but 72.4% from the previous month. This study also found that the monthly growth rate of the exports of the RMG sector was negative in FY 2019-20. Islam, et al., carried out a study on the impact of COVID-19 on the RMG industry of Bangladesh. This study is based on secondary data and found that export trends for woven and knit items have decreased since the beginning of the COVID-19 pandemic but the trends were opposite before the pandemic. This study also found a similar scenario for the total exports of the RMG sector of Bangladesh. Orders cancellations, factory shut-downs, and job loss of the RMG workers have been found in this study. This study also recommended ensuring safety measures in the RMG factories and maintaining good relationships with foreign buyers to tackle the pandemic problems. This paper also recommended policies to reduce the price temporarily and announce risk premiums for the RMG workers. Islam, R. (2020) carried out a study on the impact of COVID-19 on employment in Bangladesh. This study is based on secondary data and found that for COVID-19, the growth rate of the economy declined sharply which caused the economic crisis and millions of people lost their jobs. The manufacturing, construction and service sectors are affected very badly due to COVID-19 [36-40].

The urban informal economy was affected seriously due to the lockdowns. This paper also found that 11 million jobs were lost during a period of lockdowns (April-May 2020). This paper also estimated that 3% of the labour force may have lost their jobs, half a million jobs were lost in the manufacturing sector, 1.23 million jobs were lost in the service sector and 0.4 million people may have lost their jobs for COVID-19 in the garment of Bangladesh. Kabir, et al., carried out a study on the impact of COVID-19 on Bangladeshi RMG workers. This study is based on 2675 respondents from nationwide low-income backgrounds and found that 14% of the respondents had no food reserves at home, whereas 29% only had enough food for 1-3 days. This study highlighted that with such a shortage of food and due to the lockdown for COVID-19, starvation is a potential outcome for garment workers who come from vulnerable and low-income areas. This study argued that the COVID-19 pandemic will have long-lasting effects on garment workers especially associated with health issues, financial hardship, and inability to pay for essentials such as food and future employment opportunities.

Jebin and Hossain, carried out a study on COVID-19: increasing production cost and its effect on the RMG sector of Bangladesh. This study found that due to COVID-19, the cost of the RMG sector was affected badly. This study highlighted that due to COVID-19, the cancellation of orders the RMG sector lost \$3.16 billion which affected 1142 garments and 2.26 million workers, who were working in those garments. This study found that from April-June in 2020 more than 18000 workers faced layoffs. Shimanta, et al., have conducted a study on the readymade garment sector and COVID-19 in Bangladesh based on secondary data. This study found that due to the increasing lockdown period, the garment sector was hit badly by stopping production and cancelling orders as a result some factories failed

to give payments to the workers, and some were shut down which forced the workers to lose their jobs. Therefore, during this pandemic, the unemployment rate was increasing day by day. Sultan, et al., carried out a study on the effect of COVID-19 on the RMG sector and trade union efforts to mitigate fallout and found that a great number of garment workers are likely to get affected due to the coronavirus pandemic ranging from pay cuts to job loss. These issues will impact the socioeconomic condition of the country and to tackle the crisis of the RMG industry the trade leaders along with the government support should formulate proper policies. Syed, conducted a study on the review landscape of the garment industry of Bangladesh to adapt to the monopsony theory and disregard the neoclassical economic theory about minimum wage policy. This study found inadequate mechanisms to implement minimum wage provisions under the Bangladesh labour legislation.

Thus, the present minimum wage policy has not been implemented to its fullest as required to protect workers' rights in Bangladesh. This paper also pointed out that the garment industry in Bangladesh stanch with monopsony theory favouring the application of minimum wage law in the garment manufacturing industry. This paper also recommended that Bangladesh must follow different mechanisms adopted by several countries, followed by ILO Conventions, and it should disregard the neoclassical theory in the garment manufacturing industry setting. Ahmed, et al. carried out a study on the effects of COVID-19 in the garment industries of Bangladesh and ways to overcome its challenges. This study found that due to COVID-19 a large number of foreign orders were cancelled as a result the garment sector lost 3.15 billion \$. This study also highlighted that more than 1 million garment workers were fired during the period of COVID-19 which forced a large number of families back into poverty. Aktar, et al., carried out a study on the impacts of the COVID-19 pandemic on the RMG sector of Bangladesh. They have found the multiple impacts of COVID-19 [41-45].

In this paper, they highlighted due to COVID-19, the total export, import, remittance and economic growth have declined dramatically. This paper highlighted that COVID-19 affects the garment sector in terms of two aspects namely: economic status and social status. Concerning economic status due to COVID-19, the supply chain of the garment sector was affected badly and the export values of the garment sector declined dramatically. Concerning social status, due to COVID-19, women empowerment, gender equity, unemployment, livelihood and health and security of the garment workers are affected badly. Boudreau and Naeem, carried out a study on the economic effects of COVID-19 on the RMG factories in Bangladesh. This study is based on a representative random sample which is collected by a survey from BGME member factories. This study found that order cancellations and renegotiations by buyers were widespread during the pandemic's early stages. This paper found strong evidence that individual buyers' responses to the pandemic, though, varied substantially. This paper also found that on average, BGMEA member factories experienced a decline in revenue of almost 17.4% in 2020 compared to 2019.

Revenue losses varied widely across factories: those that were smaller, older, less well-managed, and selling to more different

buyers experienced larger revenue losses in 2020. Employment declined by 7.4% in the second half of 2020 compared to pre-COVID-19 levels, although it started to recover toward the end of 2020. In terms of capital investment, COVID-19 caused some factories to delay or decrease planned investment, including increasing automation. Hansen, et al., from NORC at the University of Chicago, conducted a study on the RMG sector workers during a global pandemic to find out the impacts of COVID-19 on the garment industry in Bangladesh and India. This study found that the COVID-19 pandemic is exposing the power imbalance between buyers and suppliers in both countries, the COVID-19 pandemic caused extreme vulnerability of garment workers particularly women migrants and informal workers, and the risk of forced labor will increase due to COVID-19. In the case of Bangladesh, this paper also recommended advancing livelihood programming for vulnerable workers, formalizing a centralized government database for the garment sector, expanding social protection programs for all garment workers, including unemployment benefits and housing and rebuilding trust between buyers, employers and workers. Hossain and Alam (2021), carried out a study on the garment sector development nexus economic growth in Bangladesh based on the time series data from 1976 to 2020 using the advanced level of econometric techniques [46].

This study found the existence of a long-run cointegration relationship between the garment sector development and the economic growth in Bangladesh. This study also found the existence of the short-run bidirectional causality between garment sector development and economic growth and the long-run causality between garment sector development and economic growth. Therefore, there is a long-run equilibrium connection between garment sector development and economic expansion in Bangladesh's economy. This study also found that concerning one standard deviation the variable garment sector development responds positively for the next fifteen years in the variable economic growth in Bangladesh. Hossain, et al., carried out a study on the impact of the COVID pandemic on garment workers in Bangladesh. For this study data are collected through questionnaires from 500 garment workers, in which 125 respondents from each of the four big cities namely: Chattogram, Dhaka, Gazipur, and Narayanganj. This study found that 99% of workers said that their factories were closed on average for 41 days during the COVID-19 pandemic, and 9% of respondents went back to the villages when the factories were closed.

Four in every ten respondents claimed that their factories retrenched workers during the period of the COVID-19 pandemic. This study also found that job and retrenchment were more in the first three months of the COVID-19 outbreak in the country and the rate of retrenchment was slightly higher in knit factories, job loss and retrenchment were caused by the cancellation of orders, shipments and factory closure, the employers did not follow the formal system for retrenchment and not all workers received their due wage or overtime allowances after being retrenched. This study found that during the period of pandemic wages of the garment workers were reduced and the lowest average monthly income of the workers was recorded in April 2020, which was about BDT 5425, after May 2020 their average income gradually increased but in October

2020, they received their normal salary. This study found that the COVID-19 pandemic had significant impacts on the jobs, wages, livelihoods, and well-being of garment workers and their families. Sharif, carried out a study on the impact of COVID-19 on RMG workers in Bangladesh. This study is based on the primary data to find the socio-economic impacts of COVID-19 on RMG workers [47].

This study found that due to COVID-19, the health condition, safety, security and social relations of the RMG workers were affected badly and they faced their livelihoods crises as their earnings were curtailed. Zaman and Khan, carried out a study on prospects, opportunities and challenges of the new payout structure. This paper found that the minimum wage payout setting or increment has no significant influence as a determinant in the garment sector to the total exports of Bangladesh and the number of garment factories. This paper pointed out that the minimum wage payout significantly acted as one of the determinants of the number of employees in the garment sector in Bangladesh. It is also found that a higher minimum wage attracts the new workforce toward the garment sector and a higher minimum wage payout in lower-graded labour will encourage the efficient workers not to leave the sector which may contribute toward the export from the garment sector.

This paper also highlighted that due to the higher minimum payout wage, the contribution of per unit efficient employees plays a significant role on the export performance of the garment sector of Bangladesh. This paper also pointed out that the owners of the garment factories are very reluctant to implement the approved new payout structure due to the lack of expertise and higher employee turnover. Hossain and Alam, conducted a study about the impacts of COVID-19 on the garment sector of Bangladesh based on secondary data using the advanced level of econometric techniques. This study found that the loss of GDP, total export values, sales revenue of the garment sector, and remittance inflows are \$31,677.475 million, \$6771.5296 million, \$6854.089 million and \$3941.4486 million in the year 2020 and in the year 2021, it will be \$13,544.415 million, \$3044.7328 million, \$2026.187 million, and \$934.513 million respectively for the countrywide lockdown due to COVID-19 outbreak. In terms of percentage, the loss of these variables will be 13.973%, 13.9726%, 21.789% and 21.650% in the year 2020 and 6.945%, 7.303%, 6.395% and 5.826% in the year 2021 respectively. This paper also concluded that the long-lasting declining trend of sales revenue of the garment sector is a red alarm for sustainable development of the garment industry as well as for the Bangladesh economy.

This study also found that in the garment sector, the growths of employment are negative by -1.442% and -10.406% in the years 2020 and 2021 respectively. It is also found that the unemployment rate is upswing by 58.234% in the year 2020 and then will fall back by 18.72% in the year 2021, but from 2022 again increase returning to moderate levels with an increasing rate of 2.47% and will continue for a long period due to COVID-19 outbreak. This study also said that the long-lasting increases in unemployment rate will cause adverse effects on socio-economic conditions including the livelihood of the marginal people. This study highlighted that during the period

of COVID-19, unexpected outcomes such as reported women being raped and suicide may adversely affect the mental health status of garment female workers in future. This study also recommended to implementation of several policies to tackle the problem of sales revenue, to improve the employment condition in the garment sector and also to improve the unemployment condition in Bangladesh [48].

Research Gaps from Literature

From the literature review, it can be said that there have been many studies in the context of the garment sector of Bangladesh. Most of the studies were survey types and explained qualitatively, but still, no one has conducted any study to estimate the structural model to identify the determinants of demand and supply of skills in the garment sector of Bangladesh to assess the needs of skilled workers in this sector as well as to find out the capacity of the training providers to bring out skilled graduates which may play an important role to formulate strategic policies for sustainable development in the garment sector of Bangladesh as well as for the national economy. Therefore, this study attempts to fill the gap in the literature. Nowadays, in Bangladesh, the demand and supply of skills in the garment sector have become extensive for the development of the garment sector as well as for the national economy. Thus, the findings of this study could be an important implication for Bangladesh. Moreover, the study has used sophisticated econometric approaches to find out the linkage between the demand and supply of skills in the garment sector and their determinants in Bangladesh, mitigating the gap in the existing literature.

Data Collection

For this study, primary data on different variables were collected from four cities, namely: Chattogram, Dhaka, Gazipur, and Narayanganj. Stratified random sampling is used to collect the sample observations, considering each city as a stratum and a part of the sample is drawn at random from each city. We select respondents from the list of beneficiaries selected by the client through simple random sampling. For this study, primary data on different variables were collected with the help of a structured questionnaire. A structured questionnaire was formulated in such a way that the objectives of the study could be achieved. This questionnaire consists of the demographic information about the respondents which includes, total employees of the factory (TEM), capacity of employment of the factory (EMC), total number of employees of different categories (skilled (NSKW), semi-skilled (NSSKW), and unskilled (NUSKW)), required number of employees of the factory per year (RNW), required number of skilled employees of the factory per year (RNSKW), monthly average salary structure of the employees (WR) in BDT, monthly average salary structure of the employees of different categories (skilled (WRSKW), semi-skilled (WRSSKW, and unskilled(WRUSKW)) in BDT, average years of education of the employees (EDU), average years of education of the employees of different categories (skilled (EDUSKW), semi-skilled (EDUSSKW), and unskilled (EDUUSKW)), minimum required qualification for the employees of different categories (skilled (REDSKW), semi-skilled (REDSSKW), and unskilled (REDUSKW)), average number of participated employees in any advertisement per year (NWP), average number of participated skilled employees in any advertisement per

year (NSKWP), expenditure of training program for skills development of the factory in each year (EXTP) in lac BDT, expenditure for research development of the factory in each year (RDEX) in lac BDT, monthly average cost of living of the employees (COST) in BDT, total investment of the factory (TINV) in crore BDT, average sales revenue of the factory in a year (REV) in crore BDT, average expenditure of the factory in a year (EXPD) in crore BDT, expected education level to recruit an employee (EXEDW), expected education level to recruit a skilled employee (EXEDSKW), facilities, performance bonus, quick promotion based on performance, and age (AGE) in years of the garment industries.

Methodology for Data Analysis

The main objective of this study is to analyses the demand and supply of skills in Bangladesh's garment sector of Bangladesh using advanced econometric techniques. Before that, the independence of different pairs of attributes are tested using the χ^2 - test. To test the association between two attributes or two variables, the following null hypotheses are set up.

- Case 1: $\begin{cases} H_0: \text{Two attributes skill and wage are not associated} \\ H_1: \text{They are not associated} \end{cases}$
- Case 2: $\begin{cases} H_0: \text{Two attributes skill and education level are not associated} \\ H_1: \text{They are not not independent} \end{cases}$

- Case 3: $\begin{cases} H_0: \text{Two attributes skill and required quality are not associated} \\ H_1: \text{They are associated} \end{cases}$

Under the null hypothesis, the calculated value of the χ^2 -test values corresponding to different cases are given below in Table 1:

Table 1: The χ^2 -Test Values

Cases	χ^2 -Test Value	p-Value
Case 1	149.7476	0.0000
Case 2	124.6383	0.0000
Case 3	249.6208	0.0000

From the estimated results of the χ^2 -test in Table 1, it can be said that there is an association between two attributes, say: skill and wage, skill and education level, and skill and the required quality of the workers at any significance level of the garment sector in Bangladesh.

Testing Equality of Two Population Means

To test the equality of two population means, the null hypotheses, which are set up against their appropriate alternative hypotheses, the Z-test values with the p-values are given below in Table 4.

Table 2: Z-Test Value with p-Value for Testing Equality of Two Population Means

Hypotheses	Z-Test Value	p-Value	Hypotheses	Z-Test Value	p-Value
$H_0: \mu_{TEM} = \mu_{EMC}$ $H_1: \mu_{TEM} \neq \mu_{EMC}$	-1.7041	0.0884	$H_0: \mu_{EDU} = \mu_{EXEDW}$ $H_1: \mu_{EDU} \neq \mu_{EXEDW}$	-7.1075*	0.0000
$H_0: \mu_{TEM} = \mu_{RNW}$ $H_1: \mu_{TEM} \neq \mu_{RNW}$	2.6274*	0.0086	$H_0: \mu_{EDUSKW} = \mu_{EXEDSKW}$ $H_1: \mu_{EDUSKW} \neq \mu_{EXEDSKW}$	-1.0424	0.2972
$H_0: \mu_{NSKW} = \mu_{RNSKW}$ $H_1: \mu_{NSKW} \neq \mu_{RNSKW}$	2.3489*	0.0188	$H_0: \mu_{EDUSKW} = \mu_{REDUSKW}$ $H_1: \mu_{EDUSKW} \neq \mu_{REDUSKW}$	0.3609	0.7181
$H_0: \mu_{WR} = \mu_{COST}$ $H_1: \mu_{WR} \neq \mu_{COST}$	7.0619*	0.0000	$H_0: \mu_{EDUSSKW} = \mu_{REDUSSKW}$ $H_1: \mu_{EDUSSKW} \neq \mu_{REDUSSKW}$	-1.4232	0.1547
$H_0: \mu_{WRUSKW} = \mu_{COST}$ $H_1: \mu_{WRUSKW} \neq \mu_{COST}$	8.8876*	0.0000	$H_0: \mu_{EDUUSKW} = \mu_{REDUUSKW}$ $H_1: \mu_{EDUUSKW} \neq \mu_{REDUUSKW}$	7.6563*	0.0000
$H_0: \mu_{WRSSKW} = \mu_{COST}$ $H_1: \mu_{WRSSKW} \neq \mu_{COST}$	0.8979	0.3692	$H_0: \mu_{RNW} = \mu_{NWP}$ $H_1: \mu_{RNW} \neq \mu_{NWP}$	12.6036*	0.0000
$H_0: \mu_{WRUSKW} = \mu_{COST}$ $H_1: \mu_{WRUSKW} \neq \mu_{COST}$	-7.0233*	0.0000	$H_0: \mu_{RNSKW} = \mu_{NSKWP}$ $H_1: \mu_{RNSKW} \neq \mu_{NSKWP}$	9.3574*	0.0000
$H_0: \mu_{EDUSKW} = \mu_{EDUSSKW}$ $H_1: \mu_{EDUSKW} \neq \mu_{EDUSSKW}$	7.6875*	0.0000	$H_0: \mu_{REV} = \mu_{EXPD}$ $H_1: \mu_{REV} \neq \mu_{EXPD}$	1.4494	0.1472
$H_0: \mu_{EDUSKW} = \mu_{EDUUSKW}$ $H_1: \mu_{EDUSKW} \neq \mu_{EDUUSKW}$	14.8455*	0.0000	$H_0: \mu_{WR} = \mu_{WRC}$ $H_1: \mu_{WR} \neq \mu_{WRC}$	-6.1710*	0.0000
$H_0: \mu_{EDUSSKW} = \mu_{EDUUSKW}$ $H_1: \mu_{EDUSSKW} \neq \mu_{EDUUSKW}$	8.8214*	0.0000	$H_0: \mu_{WRUSKW} = \mu_{WRC}$ $H_1: \mu_{WRUSKW} \neq \mu_{WRC}$	-5.3715*	0.0000

Source: Primary data of these variables are collected using a structured questionnaire: own calculations, *: indicates significant at 1% level. From the estimated results in Table 2, it can be concluded that the two population means of the variables: TEM and RNW; NSKW and RNSKW; WR and COST; WRSKW and COST; WRUSKW and COST; EDUSKW and EDUSSKW; EDUSKW and EDUUSKW; EDUSSKW and EDUUSKW; EDU and EXEDW; EDUUSKW and REDUSKW; RNW and NWP; RNSKW and NSKWP; WR and WRC; and WRSKW and WRC are not equal respectively at any significance level. Also, from the Z-test results, it can be concluded that the two population means of the variables TEM and EMC, WRSSKW and COST, EDUSKW

and EXEDUSKW, EDUSKW and REDSKW, EDUSSKW and REDSSKW, and REV and EXPD are equal, respectively.

Estimation of the Structural Model

The following structural model is formulated to determine the determinants of the demand and supply of skills in the garment sector of Bangladesh.

Demand Equation:

$$\ln \text{NSKW}_i = \beta_0 + \beta_1 \ln \text{WRSKW}_i + \beta_2 \ln \text{EDU}_i + \beta_3 \ln \text{EXTP}_i + \beta_4 \ln \text{RDEX}_i + \beta_5 \ln \text{REV}_i + \beta_6 \ln \text{TINV}_i + \beta_7 \ln \text{AGE}_i + \varepsilon_i \quad (1)$$

Supply Equation:

$$\ln \text{NSKWS}_i = \alpha_0 + \alpha_1 \ln \text{WRSKW}_i + \alpha_2 \ln \text{EDU}_i + \alpha_3 \ln \text{EXTP}_i + \alpha_4 \ln \text{RDEX}_i + \alpha_5 \ln \text{REV}_i + \alpha_6 \ln \text{TINV}_i + \alpha_7 \ln \text{AGE}_i + \alpha_8 \ln \text{WRC}_i + \alpha_9 \ln \text{COST}_i + \alpha_{10} \text{D1}_i + \alpha_{11} \text{D2}_i + \alpha_{12} \text{D3}_i + \alpha_{13} \text{D4}_i + \alpha_{14} \text{D5}_i + \xi_i \quad (2)$$

All the variables have already been defined previously.

Estimation of the Reduced Form Equations of the Structural Model:

The reduced form equations of the given structural model express each endogenous variable $\ln \text{WRSKW}$ and $\ln \text{NSKW}$

in terms of the exogenous variables $\ln \text{WRC}$, $\ln \text{EDU}$, $\ln \text{COST}$, $\ln \text{EXTP}$, $\ln \text{RDEX}$, $\ln \text{REV}$, $\ln \text{TINV}$, $\ln \text{AGE}$, D_1 , D_2 , D_3 , D_4 , D_5 and the intercept term, plus a random error term. They are given by:

$$\ln q_i = \pi_{10} + \pi_{11} \ln \text{EDU}_i + \pi_{12} \ln \text{EXTP}_i + \pi_{13} \ln \text{RDEX}_i + \pi_{14} \ln \text{REV}_i + \pi_{15} \ln \text{TINV}_i + \pi_{16} \ln \text{AGE}_i + \pi_{17} \ln \text{WRC}_i + \pi_{18} \ln \text{COST}_i + \pi_{19} \text{D}_{1i} + \pi_{110} \text{D}_{2i} + \pi_{111} \text{D}_{3i} + \pi_{112} \text{D}_{4i} + \pi_{113} \text{D}_{5i} + v_{1i} \quad (3)$$

$$\ln \text{WRSKW}_i = \pi_{20} + \pi_{21} \ln \text{EDU}_i + \pi_{22} \ln \text{EXTP}_i + \pi_{23} \ln \text{RDEX}_i + \pi_{24} \ln \text{REV}_i + \pi_{25} \ln \text{TINV}_i + \pi_{26} \ln \text{AGE}_i + \pi_{27} \ln \text{WRC}_i + \pi_{28} \ln \text{COST}_i + \pi_{29} \text{D}_{1i} + \pi_{210} \text{D}_{2i} + \pi_{211} \text{D}_{3i} + \pi_{212} \text{D}_{4i} + \pi_{213} \text{D}_{5i} + v_{2i} \quad (4)$$

where π_{11} , π_{12} , π_{13} , ..., π_{113} , π_{21} , π_{22} , π_{23} , are the coefficients of the reduced form equations of the structural model. Here, $\ln \text{NSKW}_i = \ln \text{NSKWS}_i = \ln q_i$.

Since the right-hand side variables of equations (3) and (4) are exogenous and uncorrelated with the random error terms, using the OLS method we run the reduced form equations (8) and (9). The OLS estimates of the reduced form equation (3) are given below in Table 3.

Table 3: The OLS Estimates of the Reduced Form Equation (3)

Variable	Coeff.	Std. Error	t-Statistic	Prob.	[95% Conf. Interval]	
					Lower Limit	Upper Limit
Constant	5.5190	3.5590	1.5507	0.1237	-1.5210	12.5679
lnEDU	0.5690**	0.3269	1.7404	0.0844	-0.0785	1.2166
lnEXTP	0.2335	0.1499	1.5571	0.1222	-0.0635	0.5304
lnRDEX	-0.1203**	0.0709	-1.6962	0.0925	-0.2609	0.0201
lnREV	0.1675*	0.0669	2.5080	0.0135	0.0352	0.2998
lnTINV	0.1627*	0.0577	2.8191	0.0057	0.0484	0.2770
lnAGE	-0.1198	0.1765	-0.6789	0.4985	-0.4694	0.2298
lnWRC	0.1176	0.2055	0.5722	0.5683	-0.2895	0.5246
lnCOST	-0.2674	0.2687	-0.9954	0.3216	-0.7995	0.2647
D1	0.0453	0.1767	0.2563	0.7982	-0.3046	0.3952
D2	0.2209	0.3197	0.6909	0.4910	-0.4124	0.8541
D3	-0.1181	0.1803	-0.6554	0.5135	-0.4752	0.2389
D4	0.4351	0.4864	0.8944	0.3730	-0.5284	1.3985
D5	-0.5369	0.3315	-1.6195	0.1081	-1.1934	0.1197
Test			Test Value		Prob	
LM Test for Autocorrelation			1.3591		0.5086	
LM test for Heteroscedasticity			11.1524		0.5981	
ARCH Test			0.1168		0.7325	
F-Test for Misspecification			0.2041		0.6523	
JB Test for Normality of Errors			3.1811		0.1844	
VIF Test for Multicollinearity			VIF		1/VIF	
lnEDU			1.31		0.7644	
lnEXTP			1.43		0.6971	
lnRDEX			1.16		0.8657	
lnREV			1.45		0.6880	
lnTINV			1.56		0.6410	
lnAGE			1.15		0.8715	

lnWRC	1.12	0.8899
lnCOST	1.15	0.8715
D ₁	1.39	0.7187
D ₂	2.70	0.3704
D ₃	1.55	0.6435
D ₄	1.38	0.7259
D ₅	3.01	0.3323
Mean VIF	1.57	

**: indicates significant at 10% level, *: indicates significant at 5% level.

From the OLS estimates of reduced form equation (8) of the structural model in Table 3, it is found that the elasticities of the number of skills in the garment sector of Bangladesh with respect to the variables EDU, EXTP, REV, TINV, WRC, are positive but with respect to the variables RDEX, AGE, and COST are negative. The positive effect of the variable EDU, on the quantity of skills is statistically significant at a 10% significance level, and the positive effects of REV and TINV are statistically significant at a 1% significance level. The negative effect of the variable RDEX is statistically significant at a 1% significance level. The effects of the dummy variables D₁, D₂, and D₄ are positive on the quantity of skilled workers, but the effects of D₃ and D₅ are negative. However, these effects of the dummy variables are not statistically significant at all.

Sensitivity Analysis: The diagnostic tests for serial correlation, heteroscedasticity, autoregressive conditional heteroscedasticity, multicollinearity, and non-normal errors are conducted and the results are reported in Table 9. The test results indicate that there is no evidence of serial correlation and there is no problem of heteroscedasticity. Also, the autoregressive conditional heteroscedasticity is not present in the model. The test results support that there is no problem of multicollinearity. The test results also support that there is no problem with the normality of random error terms in the reduced form equation (3) and the model is correctly specified.

Apply the OLS method the reduced form equation (4) is run and the OLS estimates of the reduced form equation (9) of the structural model are given below in Table 4.

Table 4: The OLS Estimates of the Reduced Form Equation (4)

Variable	Coeff.	Std. Error	t-Statistic	Prob.	[95% Conf. Interval]	
					Lower Limit	Upper Limit
Constant	9.4556	1.0639	8.8873	0.0000	7.3483	11.5629
lnEDU	-0.0235	0.0977	-0.2406	0.8103	-0.2171	0.1701
lnEXTP	-0.0539	0.0448	-1.2019	0.2318	-0.1427	0.0349
lnRDEX	0.0300	0.0212	1.4149	0.1598	-0.0111	0.0720
lnREV	0.0158	0.0199	0.7921	0.4299	-0.0237	0.0554
lnTINV	-0.0121	0.0172	-0.6998	0.4855	-0.0462	0.0221
lnAGE	-0.0181	0.0528	-0.3430	0.7322	-0.1226	0.0864
lnWRC	0.0190	0.0614	0.3098	0.7573	-0.1027	0.1407
lnCOST	0.0262	0.0803	0.3264	0.7447	-0.1329	0.1853
D ₁	-0.0208	0.0528	-0.3937	0.6945	-0.1253	0.0838
D ₂	0.0467	0.0956	0.4886	0.6261	-0.1426	0.2360
D ₃	-0.0597	0.0539	-1.1072	0.2705	-0.1664	0.0471
D ₄	-0.2335	0.1454	-1.6057	0.1111	-0.5215	0.0545
D ₅	0.0531	0.0991	0.5363	0.5928	-0.1431	0.2494
Test			Test Value		Prob	
LM Test for Autocorrelation			0.4280		0.8073	
LM test for Heteroscedasticity			12.8554		0.4590	
ARCH Test			0.0659		0.7974	
F-Test for Misspecification			0.8319		0.3636	
JB Test for Normality of Errors			3.5948		0.1657	
lnEDU			1.31		0.7644	
lnEXTP			1.43		0.6971	
lnRDEX			1.16		0.8657	
lnREV			1.45		0.6880	
lnTINV			1.56		0.6410	

lnAGE	1.15	0.8715
lnWRC	1.12	0.8899
lnCOST	1.15	0.8715
D ₁	1.39	0.7187
D ₂	2.70	0.3704
D ₃	1.55	0.6435
D ₄	1.38	0.7259
D ₅	3.01	0.3323
Mean VIF	1.57	

From the OLS estimates in Table 4, it is found that the effects of the variables RDEX, REV, WRC, COST, D2 and D5 are positive on the wage rate of skilled workers (WRSKW) in the garment sector of Bangladesh but the effects of the variables EDU, EXTP, TINV, AGE, D1, D3 and D4 are negative. However, the effects of these variables are not statistically significant at all. Therefore, it can be said that the wage rate of the skilled workers (WRSKW) in the garment sector of Bangladesh is very poor and has no significant relationship with any factor which implies that the workers are deprived of their salary structure which is not a good sign for the development of the garment sector of Bangladesh. Therefore, the government and other stakeholders have to take the necessary steps to increase the wages of the skilled workers (WRSKW) of the garment sector of Bangladesh soon.

Sensitivity Analysis: The diagnostic tests for serial correlation, heteroscedasticity, autoregressive conditional heteroscedasticity, multicollinearity, misspecification of the functional form and non-normal errors are conducted for the reduced form equation (4) and the results are reported in Table 3. The test results indicate that there is no evidence of serial correlation, heteroscedasticity and multicollinearity. Also, the autoregressive conditional heteroscedasticity is not present in the model. The test results also support that there is no problem with the normality of random error terms in the wage equation and the functional form is correctly specified.

Two-Stage Least Squares (2SLS) Estimation:

Two-stage least squares (2SLS) estimates are obtained by replacing the fitted values of the endogenous variable wage rate of the skilled workers (WRSKW) of the garment sector of Bangladesh, which are obtained from the reduced form equation (4), on the right-hand side of the structural equations. The two-stage least squares estimate of the demand and supply functions of the structural model are given below in Tables 5 and 6.

Table 5: Two-Stage Least Squares (2SLS) Estimates of the Demand Function

Variable	Coeff.	Std. Error	t-Statistic	Prob.	[95% Conf. Interval]	
					Lower Limit	Upper Limit
Constant	9.4966	15.2848	0.62	0.534	-20.461	39.4542
WRSKW	-0.5289	1.5772	-0.34	0.737	-3.6202	2.5624
lnEDU	0.5456**	0.3037	1.80	0.070	-0.0470	1.1408
lnEXTP	0.1935	0.1595	1.21	0.225	-0.1191	0.5061
lnRDEX	-0.1099	0.0781	-1.41	0.160	-0.2630	0.0433
lnREV	0.1775*	0.0666	2.67	0.008	0.0470	0.3081
lnTINV	0.1507*	0.0580	2.60	0.009	0.0370	0.2645
lnAGE	-0.1253	0.1713	-0.73	0.465	-0.4611	0.2105

**: indicates significant at 10% level, *: indicates significant at 1% or 5% level

From the 2SLS estimates of the demand function of skills in Table 5, it is found that for increasing 100% wage rate of the skilled workers (WRSKW) the demand for skills will decline by 52.89% which is not statistically significant, for increasing 100% education level (EDU) the demand of skills will be increased by 54.56% which is statistically significant at 10%, for increasing 100% expenditures for training program of the factories (EXTP) the demand of skills will be increased by 19.35% which is not statistically significant, for increasing 100% research and development expenditures of the companies (RDEX) the demand of skills will be declined by 10.99% which is not statistically significant, for increasing 100% sales revenue of the companies (REV) the demand of skills will be increased by 17.75% which is statistically significant at any significance level. Also, it is found that for increasing 100% total investment of the companies (TINV) the demand for skills will be increased by 15.07% which is statistically significant at any significance level and for increasing 100% age of the factories the demand for skills will be declined by 12.53% which is not statistically significant.

Table 6: Two-Stage Least Squares (2SLS) Estimate of the Supply Function

Variable	Coeff.	Std. Error	t-Statistic	Prob.	[95% Conf. Interval]	
					Lower Limit	Upper Limit
Constant	4.3913	3.1761	1.38	0.169	-1.8993	10.6819
lnEDU	-0.0079	0.2930	-0.03	0.978	-0.5883	0.5724
lnEXTP	0.1578	0.1333	1.18	0.239	-0.1062	0.4218
lnRDEX	-0.0656	0.0633	-1.04	0.302	-0.1908	0.0597
lnREV	0.0588	0.0595	0.99	0.321	-0.0590	0.1767
lnTINV	-0.0210	0.0518	-0.41	0.686	-0.0590	0.1767
lnAGE	0.2320	0.1561	1.49	0.140	-0.0772	0.5412
lnWRC	-0.3421**	0.1830	-1.87	0.064	-0.7046	0.0204
lnCOST	0.4144**	0.2396	1.73	0.086	-0.0602	0.8889
D ₁	0.0776	0.1572	0.49	0.622	-0.2337	0.3889
D ₂	0.3120	0.2845	1.10	0.275	-0.2514	0.8754
D ₃	0.1206	0.1604	0.75	0.454	-0.1971	0.4383
D ₄	0.2998	0.4331	0.69	0.490	-0.5579	1.1575
D ₅	-0.4695	0.2948	-1.59	0.114	-1.0533	0.1143

** indicates significant at 10% level: * indicates significant at 1% or 5% level.

From the 2SLS estimates of the supply equation in Table 6, it is found that the variables EDU, EXTP, RDEX, REV, TINV, AGE and all the dummy variables have no significant effects on the supply of skills in the garment sector of Bangladesh. It is also found that for increasing 100% wage rate of the competitive sectors (WRC), the supply of skills will decline by 34.21% which is statistically significant at 10% level, and for increasing 100% living cost of the workers (COST) of the garment sector of Bangladesh, the supply of skills will be increased by 41.44% which is also statistically significant at 10% level which implies that in our society people are bound to work in the garment sector of Bangladesh due to increases their living cost. Thus, it can be said that most of the poor people work in Bangladesh's garment sector. It should be noted that the variable WRSKW is omitted due to a collinearity problem in the supply function of skills.

Discussion

Formulating and implementing different policy frameworks for skills development in Bangladesh's garment sector is essential, which may play an important role in the sustainable development of Bangladesh's garment sector and national economic growth. The skills development policies are very important to create quality human resources which may play an important role in increasing labour intensity on economic growth in Bangladesh. As a result, Bangladesh's economic growth will accelerate at a faster rate, and economic development will be sustainable. Economic development is indispensable to ensure the welfare enhancement of many individuals living in least developed and developing societies. Nowadays, the garment sector is one of the important economic driving forces for both least developed and developing societies and many countries are investing considerably in the development of the garment sector. Many Asian countries namely: India, China, Cambodia, Nepal, Myanmar, Thailand and Vietnam, over the last few decades have increasingly implemented different policy frameworks in the garment industry for sustainable economic growth

and development and the garment sector of these countries contributes significantly to economic growth as well as for reducing the unemployment rate.

However, still now as an Asian country, Bangladesh is far beyond this. The garment sector of Bangladesh earned 33407.69 million USD which is relatively smaller than some other Asian countries say: as China, Thailand and Vietnam. Thus, to reduce the income gap between Bangladesh's garment industry and some other Asian countries, it is essential to formulate and implement different policies for which the productivity of the garment sector will increase and per unit production cost will decrease. The development of the garment sector is highly associated with the demand and supply of skills and identifying the determinants of demand and supply of skills in this sector. That is why, the principal purpose of this research paper is to formulate a structural model for the demand and supply of skills in the garment sector of Bangladesh and also to investigate the factors that the demand and supply of skills depend on. Based on the estimated results the policies should be taken and implemented for the development of the garment sector of Bangladesh as a result the garment sector can contribute significantly to the national economic growth and sustainable development like other Asian countries. This research work is based on the primary data. The primary data on different variables are collected from four mega cities namely: Chattogram Dhaka, Gazipur, and Narayanganj using the structural questionnaires. To collect the primary data stratified random sampling is used considering the sample observations in each city as a stratum and a part of the sample is drawn at random from each city.

The sample of 130 observations is collected from the list of beneficiaries selected by the client through a simple random sampling technique. For this research paper information on different variables say total employees of the factory (TEM), capacity of employment of the factory (EMC), total number of employees of different categories (skilled (NSKW), semi-

skilled (NSSKW), and unskilled (NUSKW)), required number of employees of the factory per year (RNW), required number of skilled employees of the factory per year (RNSKW), monthly average salary structure of the employees (WR) in BDT, monthly average salary structure of the employees of different categories (skilled (WRSKW), semi-skilled (WRSSKW, and unskilled (WRUSKW)) in BDT, average years of education of the employees (EDU), average years of education of the employees of different categories (skilled (EDUSKW), semi-skilled (EDUSSKW), and unskilled (EDUUSKW), minimum required qualification for the employees of different categories (skilled (REDSKW), semi-skilled (REDSSKW), and unskilled (REDUSKW)), average number of participated employees in any advertisement per year (NWP), average number of participated skilled employees in any advertisement per year (NSKWP), expenditure of training program for skills development of the factory in each year (EXTP) in lac BDT, expenditure for research development of the factory in each year (RDEX) in lac BDT, monthly average cost of living of the employees (COST) in BDT, total investment of the factory (TINV) in crore BDT, average sales revenue of the factory in a year (REV) in crore BDT, average expenditure of the factory in a year (EXPD) in crore BDT, expected education level to recruit an employee (EXEDW), expected education level to recruit a skilled employee (EXEDSKW), facilities, performance bonus, quick promotion based on performance, and age (AGE) in years of the garment industries are collected using a structural questionnaires.

In this paper first, the χ^2 -test is applied to detect the association between different pairs of attributes say, skills and wages; skills and education level; and skills and required quality. Later on, the Z-test is applied to test the equality of two population means. Later on, a structural model is formulated and estimated to determine the determinants of the demand and supply of skills in the garment sector of Bangladesh. First, the reduced form of the demand equation for skills of the structural model is estimated using the OLS method and then the reduced form of the wage equation for skilled workers is estimated using the OLS method. Finally, two two-stage least squares method (2SLS) is applied to estimate the demand and supply equations of skills of the structural model.

Conclusions

In this paper, a structural model is developed to assess the factors influencing the demand and supply of skills in Bangladesh's garment industry. This model can be used to formulate and implement different policy frameworks for skills development in Bangladesh's garment industry. Policies should be formulated based on the estimated results of the structural model. Before estimating the structural model, first the χ^2 -test is applied to detect the association between different pairs of attributes of the skilled workers. From the estimated results of the χ^2 -test [Table 1], it can be said that there is an association between two attributes say: skill and wages; skill and education level; and skill and the required quality of the workers at any significance level in Bangladesh's garment industry.

Later on, the Z-test is applied for testing equality of two population means. From the estimated results [Table 2], it can be concluded that the two population means of the variables: TEM

and RNW; NSKW and RNSKW; WR and COST; WRSKW and COST; WRUSKW and COST; EDUSKW and EDUSSKW; EDUSKW and EDUUSKW; EDUSSKW and EDUUSKW; EDU and EXEDW; EDUUSKW and REDUSKW; RNW and NWP; RNSKW and NSKWP; WR and WRC; and WRSKW and WRC are not equal respectively at any significance level. Also, from the Z-test results it can also be concluded that the two population means of the variables TEM and EMC; WRSSKW and COST; EDUSKW and EXEDUSKW; EDUSKW and REDSKW; EDUSSKW and REDSSKW; and REV and EXPD are equal respectively. After that the developed structural model is estimated to determine the determinants of the demand and supply of skills in the Bangladesh's garment industry using the advanced level of econometric techniques based on the primary data. From the OLS estimates [see Table 3] of the reduced form equation of the structural model it is found that the elasticities of the number of skills in the garment sector of Bangladesh with respect to the variables EDU, EXTP, REV, TINV, WRC, D1, D2, and D4 are positive, however, with respect to the variables RDEX, AGE, COST, D3 and D5 are negative. The effects of the variables EDU, REV, TINV and RDEX are statistically significant. The diagnostic test results support that there are no problems of serial correlation, heteroscedasticity, autoregressive conditional heteroscedasticity, multicollinearity, and normality of the random error terms of the reduced form equation.

The test result also supports that the model is correctly specified. Therefore, it can be said that the preferred reduced form for skills can be used for policy implication and decision-making purposes in the garment sector of Bangladesh and the impact of policy changes considering the explanatory variables of the reduced form equation for the number of skills do not cause major distortion in the level of quantity of skills due to stable pattern of parameters. Also, from the OLS estimates [see Table 4] of the reduced form of the wage equation, it is found that the effects of the variables EDU, RDEX, REV, WRC, COST, D2 and D5 are positive and the effects of the variables EXTP, TINV, AGE, D1, D3 and D4 are negative on the wage rate of skilled workers in Bangladesh's garment industry.

The effects of these variables are not statistically significant at all. Since the effects of all the variables on the wages of skilled workers are not significant at all indicating that the workers in the garment sector are deprived of their due wages. This is not a good sign to increase the productivity of the labor force in Bangladesh's garment industry. Finally, two two-stage least squares method (2SLS) is applied to estimate the demand and supply equations of skills of the structural model. From the 2SLS estimates [see Table 5] of the demand function of skills of the structural model, it is found that the effects of the variables EDU, EXTP, REV and TINV on the demand of skills are positive however the effects of the variables WRSKW, RDEX, and AGE is negative. However, the effects of the variables EDU, REV and TINV are statistically significant. Also, from the 2SLS estimates [see Table 6] of the supply equation of skills of the structural model it is found that the effects of the variables EXTP, REV, AGE, COST, D1, D2, D3 and D4 on the supply of skills are positive and the variables EDU, RDEX, TINV, WRC, and D5 are negative. However, the effects of only the variables WRC and COST are statistically significant and consistent with the OLS estimates of the supply equation of skills.

Managerial Implications

From the analytical results, the following points should be implemented to accelerate the development of Bangladesh's garment industry and also for the national economic growth.

1. It is found that the two attributes, namely, skills and wages; skills and education level; and skills and required quality are associated, in Bangladesh's garment industry. Therefore, emphasis should be given to wages, years of education, and required quality in the case of hiring workers.
2. Since there is a significant difference in the demand and supply of workers and skilled workers in the garment sector of Bangladesh, that is why to fulfil the demand of workers and skilled workers of the garment sector of Bangladesh, the government and the other stakeholders have to take necessary measures to produce skilled labour forces. In particular, the government of Bangladesh developed such types of technical institutions from which quality skilled workers can be supplied in Bangladesh's garment industry.
3. Since the average monthly salary is smaller than the average monthly living cost of the workers [own calculation], therefore the government including other stakeholders should take necessary measures to review the salary structure of the workers. Even in Bangladesh, the price of essential products is increasing rapidly, therefore with this poor salary structure, it is impossible to fulfil their daily needs. As a result, most of the garment workers maintain poor living standards. They are suffering from a lack of nutrition due to their poor salary structure. Due to lack of nutrition, garment workers may feel stress and tiredness, which may also contribute to the risk of developing some illnesses and other health problems such as being overweight or obese, high blood pressure, depression etc. That is why, garment workers would not be able to put their hard work into producing goods and services in the garment sector. It is found that the wage rate of the competitive sectors is higher than the garment sector which is normally distributed, but the wage rate of the garment sector is not normal and looks like a gamma distribution [own calculation]. Therefore, the production function of the garment sector of Bangladesh is operating under decreasing return to scale which is not a good sign for the sustainable development of the garment sector as well as in the national economy. Therefore, it can be concluded that it is very important to increase the wage rate of the workers in the garment sector of Bangladesh. The government including other stakeholders should take necessary measures immediately to increase the wage rate of the workers in the garment sector of Bangladesh otherwise the price hiking situation forces the workers to raise their voices on the street for demanding to increase in their wage rate which may cause the turmoil situation in the garment sector of Bangladesh in near future. Also, for the betterment the government can develop a rationing policy for garment workers which may play a significant role in the development of the garment sector as well as in the national economy.
4. It is found that the education level of the maximum workers is very poor [own investigation]. It is not a good sign for the sustainable development of the garment sector in Bangladesh. Therefore, the government including other stakeholders have to develop different policies to create skilled workers for which the minimum level of education would be 12 years which may play a significant role in shifting the production function of the garment sector from decreasing return to scale to increasing return to scale. As a result, per unit production cost will decline and this sector can compete with its rivals globally. As a result, this industry can earn more foreign currencies. As a result, the development of the garment sector will be at a faster rate as well as the national economy.
5. Since it is found that very few numbers of garment factories have developed in Bangladesh during the last 10 years [own investigation]. Therefore, a common question can be raised to the general people of Bangladesh, why have businessmen not been encouraged to develop garment factories in recent years? To find the answer to this question the government including other stakeholders have to find out the causes of the problems and then resolve the problems as a result the businessmen of Bangladesh will be encouraged to establish garment factories which may play a significant role in the development of the national economy at a faster rate. Otherwise, it may work as a barrier to the economic and socio-economic development of Bangladesh in future.
6. Since the variables, education level, expenditure for training programs, sales revenue and total investment play a significant positive role in the demand for skills in the garment sector of Bangladesh, therefore emphasis should be given to creating literate skilled workers, considering more expenditure for training programs, more investment in the garment sector, and the government and other stakeholders have to develop policy- frameworks to earn more sales revenue as a result the demand for skilled workers will increase. Therefore, this sector will be able to create more job opportunities as a result the development of the garment sector will be sustainable and can contribute significantly to the national economic growth. It is found that the research and development expenditure has a significant negative effect on the demand for skills in Bangladesh's garment industry indicating that the executives misuse the research and development expenditure. Therefore, the government including other stakeholders have to develop the management and monitoring systems for which the research and development expenditure will be used appropriately and properly for the garment sector development as a result demand for skills in the garment sector will increase.
7. Since the variable wage rate of the competitive sectors plays a significant negative role in the supply of skills. Therefore, the government including other stakeholders have to take necessary measures to increase the wage rate of the garment sector of Bangladesh as a policy framework for sustainable development of the garment sector otherwise would be very difficult to find quality workers in the garment sector. As a result, the production function will be running as a decreasing return to scale for a long period. Therefore, it may work as a barrier to the development of the garment sector as well as for the national economy, and in future, this sector may happen like the Jute industry of Bangladesh.
8. Since the cost of living of the workers plays a significant positive role in the supply of skills which implies that the people are bound to work in the garment sector due to increasing the cost of their livelihood which implies that this sector is recruiting unskilled workers, as a result, the

productivity of the labor force is smaller than the capital investment and the production function of the garment sector of Bangladesh is running under decreasing return to scale. This is not a good sign for the garment sector of Bangladesh. Therefore, the government including other stakeholders have to create or develop this sector by implementing conventional labor laws, giving handsome payment for overtime, increasing the wage rate for which the garment workers will be able to fulfil their daily demands, by giving different types of facilities like as dining facilities with subsidy, medical service facilities, childcare services, maternity leave according to the ILO and WHO guidelines, by controlling the inflationary rate, etc. for which the educated and quality workers will be encouraged to work in the garment sector of Bangladesh as a result the development of the garment sector will be at a faster rate which may play a significant role for sustainable economic and socio-economic development. The garment sector will run with increasing returns to scale as a result; per unit production cost will decline, and this sector can earn more profits, which may play a significant role in national economic growth.

Conflict of Interest

As the corresponding author of the paper titled "A Structural Model for Assessing the Factors Influencing the Demand and Supply of Skills in the Garment Industry of Bangladesh", I declare that there is no conflict of interest.

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