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Factors Impacting Unemployment Rates in South Asian Developing Nations. A Panel ARDL Approach Utilizing the Pedroni Cointegration Method

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ABSTRACT

This paper has been created to pin point the key economic elements influencing the unemployment rate in developing nations of South Asia. Bangladesh, India, and Pakistan have been selected as the focus countries for this study. The research aims to illustrate the impact of GDP growth rate, population growth, inflation, FDI inflow, and industrial value addition on unemployment in these developing nations. Data has been gathered from the World Bank database, ranging from 1991 to 2024. The panel unit root tests (LLC and IPS) confirmed the stationarity of all variables in their first-difference values. The findings from the Pedroni residual cointegration test indicated that the series demonstrates cointegration and that long-term equilibrium relationships exist among the variables. Results from the panel ARDL analysis show that FDI inflow, inflation, and industrial value added contribute to a reduction whereas GDP growth and population growth both contribute to the rise in unemployment. Conversely, the short-run coefficients suggest that all variables, except for industrial value addition, are inversely related to the unemployment rate in these nations. The research concludes with recommendations for appropriate policy measures necessary to maintain low and stable unemployment rates

INTRODUCTION

Unemployment is a term that describes individuals who are capable of working and are actively looking for employment but are unable to secure a job. This category also includes those individuals within the workforce who are currently employed but do not hold a suitable position. Typically assessed through the unemployment rate, which is determined by dividing the number of unemployed people by the total workforce. Unemployment acts as one of the key indicators of a country's financial condition. Unemployment is considered as one of the major concerns in developing nations. Now a day's thousands of people are found to be unemployed despite having sufficient skill and knowledge. There are several economic factors that trigger the high percentage of unemployment in these developing nations, like Bangladesh, India, and Pakistan. Unemployment rate in India in 2024 was 4.20% which was a 0.03% increase from the year 2023 (World Bank, 2024). India had faced an unemployment rate of 4.82% in the year 2022 (World Bank, 2024). In the July-September quarter of 2024, Bangladesh's unemployment rate increased to 4.49 percent, up from 4.07 percent during the same period the previous year (BBS, 2024). Official data indicates that women have been disproportionately affected by this rise, as political instability and security issues have adversely impacted the labor market. The unemployed population in Pakistan experienced a dramatic increase of 31 percent, equating to 1.4 million individuals, escalating from 4.5 million in 2020-21 to 5.9 million in 2024-25 (PBS, 2024). This trend underscores the growing difficulties within the nation's labor market.

The increase in unemployment has been noted across all age demographics and both sexes over the last four years (PBS, 2024). There are several factors contributing to the high rate of unemployment in these developing nations. Many developing economies realize GDP growth of 3-5%, but a large part of this growth stems from productivity improvements or capital-intensive sectors rather than labor-intensive industries. To sustain employment rates, a nation requires roughly 2-3% economic growth for every 1% increase in population. The inconsistency between population increase and the capacity for job creation leads to a form of structural unemployment that remains prevalent, even during phases of economic growth. Low domestic savings, limited access to credits, and capital flights reduce available capital for job creation. Unreliable electricity, poor transportation networks, and limited internet connectivity makes businesses less competitive, and limit their growth potential thus creating additional unemployment. Factors that also lead to unemployment include economic downturns such as recessions and depressions, improvements in technology, the practice of outsourcing jobs, and the voluntary act of resigning from one job to seek another. Unemployment has significant and extensive consequences on various levels. For individuals, losing a job frequently results in financial instability and can cause serious psychological impacts, such as stress, anxiety, and a reduced sense of self-esteem. The absence of a steady income complicates the ability to fulfill basic daily requirements and may lead to a deterioration in overall quality of life. Prolonged unemployment can also diminish professional skills,

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making it more difficult to reintegrate into the job market. At the economic level, elevated unemployment rates diminish consumer spending, which is a crucial component of economic growth. With fewer individuals receiving wages, there is a decline in the market for products and services, potentially resulting in a cycle of decreased production, additional layoffs, and economic stagnation. Furthermore, unemployment imposes a greater strain on government resources due to increased dependence on social welfare programs and a reduction in tax revenue.

Research Gap

When we reviewed earlier empirical studies carried out by numerous researchers worldwide, we found that the majority of them used time series data and concentrated on single-country analysis; their methods of analysis and interpretations differed from our study, which is based on multiple-country analysis. The time selection pattern is another significant factor that sets our study apart from others. While some studies have been discovered to have taken longer to complete their research, we have collected panel data spanning from 1991 to 2024. While several academics have performed panel data analysis in related fields, our research does not entirely align with their explanatory variables and chosen countries. In this study, we have attempted to identify the dynamic economic factors that could significantly affect the unemployment rates in developing South Asian countries including Bangladesh, India, and Pakistan. As a result, we are convinced that this study is distinct from others and will contribute important knowledge to the field of research.

Objectives of the Study

In our research paper, we have delineated the following objectives:

- i) To determine the economic variables that affect the unemployment rate in developing South Asian nations, such as Bangladesh, India, and Pakistan
- ii) To investigate the immediate and long-term impacts of GDP growth rate, FDI inflow
Inflation, population growth, and industrial value addition have an impact on the unemployment rate in these developing economies.
- iii) To propose suitable policy measures required to tackle the unemployment issue in these Asian developing nations.

LITERATURE REVIEWS

The impact of foreign direct investment on unemployment in the Middle East and North Africa (MENA) region between 2011 and 2021 was examined by Nur & Raji (2025). The study used fixed-effect and random-effect estimators to achieve this. The findings demonstrate that while government spending and exports also have negative coefficients but have little effect on unemployment, FDI, GDP growth, and population growth all have negative coefficients and have a considerable impact. This suggests

that population increase, GDP expansion, and foreign direct investment all help to lower unemployment in the MENA region.

In a study conducted by Singh (2025), the focus was on the World Bank's involvement in tackling unemployment in developing countries. Consequently, the paper aimed to critically assess the World Bank's role in addressing youth unemployment, with an emphasis on its policy frameworks, data infrastructure, funding mechanisms, and global partnerships. Through the analysis of country-specific case studies and the examination of evidence from initiatives like Skills4Girls, S4YE, and Beti Bachao Beti Padhao, the study underscores the necessity for localized, data-driven, and inclusive employment solutions.

(Pratiwi *et al.*, 2025) investigated how the open unemployment rate in Banten Province was affected by education level, poverty level, minimum wage, foreign investment, and domestic investment. Multiple linear regression analysis is used in a descriptive quantitative methodology. This study makes use of secondary data from the Central Bureau of Statistics of Banten Province's official website that spans the years 2010 to 2024. The results of the data analysis show that the open unemployment rate is significantly impacted negatively by the education level variable and significantly positively by the poverty level variable. On the other hand, Banten Province's open unemployment rate is not significantly impacted by the variables of minimum wage, foreign investment, and domestic investment.

Islam *et al.* (2025) conducted a research to explore the presence of Okun's law in Bangladesh. The researchers collected data from the World Bank data base, spanning the years 1991 to 2023. The Johansen cointegration method had been utilized to verify the long-term relationship between the GDP growth rate and unemployment in Bangladesh. The results indicated that the GDP growth rate decreases unemployment over the long term, thereby confirming the existence of Okun's law within the context of Bangladesh.

With a focus on the Republic of Moldova, Vintu (2025) conducted a study to examine unemployment from theoretical, empirical, and policy perspectives. The main reasons of unemployment are identified in the article and include globalization, skill mismatches, demographic considerations, economic downturns, and technology improvements. A case study of the Republic of Moldova offers insightful information about current unemployment patterns, the root causes, and the efficacy of government initiatives. The results show that unemployment is a complicated problem that necessitates integrated approaches to strike a balance between social inclusion, economic progress, and environmental sustainability.

Muhammad Irfan Khan *et al.*, (2023) carried out a study to examine the effects of foreign direct investment (FDI), private investment, exports, and government spending on unemployment in Pakistan. The annual data utilized in this research, covering the years 1985 to 2019, was sourced

from various editions of economic surveys and the official website of the Central Bank of Pakistan. The (ARDL) model had been employed to explore the relationships among the variables over the long term. The findings indicate that FDI and exports contribute to a decrease in unemployment, whereas government spending does not have any effect. Additionally, private investment exhibits an inverse correlation with unemployment. The results further demonstrate a long-term relationship between foreign direct investment, exports, government spending, and private investment with unemployment.

(Siddiq, 2021) conducted a study to explore the determinants of unemployment in developing countries. To carry out the study, data from ten chosen developing nations were sourced for the period spanning from 2000 to 2019, as provided by the World Bank. The Generalized Method of Moments (GMM) model was applied, and according to the results, every variable is statistically significant. While unemployment is positively impacted by population and external debt, it is negatively impacted by GDP, inflation, remittances, currency rates, and education spending.

(Bekzod *et al.*, 2020) carried out research to investigate how economic growth (GDP), inflation, and population growth affect the unemployment rate and the relevance of the connections between these elements in Uzbekistan. The OLS method was employed. The outcomes showed that only substantial levels of economic growth and population growth rate have a remarkable impact on the jobless rate, where a 1% rise in these independent variables has led to a measurable decline in the unemployment rate. Abugamea and Gaber (2019) performed a study aimed at analyzing the factors contributing to unemployment in Palestine over the period from 1994 to 2017. The study examines the relationship between unemployment and a number of variables, such as GDP, inflation, labor force participation, external trade, and labor movement limitations, using OLS econometric analysis. The study found that GDP has a significant negative effect on unemployment, while price level, work force, and restrictions on labor migration remarkably and positively affect unemployment. Moreover, external trade does not significantly impact unemployment.

Ayhan (2019) conducted a study in Turkey ranging from 2005 to 2018. The research aimed to identify the factors affecting unemployment in Turkey. The research findings indicated that industrial production has an inverse effect on the consumer cost index, though the interest rate positively influences the number of unemployed.

Islam & Das (2019) carried out a study aimed at examining the long-term relationships between inflation, unemployment, and GDP growth rate in Bangladesh. The authors employed the Johansen cointegration method, vector error correction, and impulse reaction function to interpret their findings. The research was based on data collected from 1991 to 2016. The findings of this research suggest that, over time, all variables exhibit cointegration. In the long term, inflation positively influences the GDP

growth rate in Bangladesh, whereas unemployment has a notably adverse effect. The findings from the Vector Error Correction Model (VECM) indicate that the GDP growth rate necessitates an annual error correction of 77%, while the unemployment rate requires about 28% error correction, and inflation demands roughly 82% error correction each year to achieve equilibrium.

(Halabi & Kourani, 2019) conducted a study to investigate the various factors influencing unemployment status in Lebanon, including age, gender, geographical location, educational attainment, college major, and work experience. Additionally, it aims to predict college majors that may help reduce unemployment in Lebanon. The study utilized a survey method for data collection, and after refining the questionnaires, a total of 731 responses from diverse Lebanese regions were included in this research. The findings indicate that individuals with higher educational qualifications and greater work experience are more likely to secure employment. Furthermore, it was observed that males have a greater likelihood of being hired. Regarding geographical factors, residents of the capital, Beirut, have enhanced opportunities to enter the labor market.

A study by Buba & Ishak (2014) looked into how Nigerian unemployment was affected by real GDP. The research covers the period from 1977 to 2011 to assess Real GDP and unemployment in Nigeria: both short-term and long-term links, with unemployment serving as the dependent variable. In addition to analyzing the long run and the Error Correction Model (ECM), the study used the Autoregressive Distributed Lag (ARDL) Model to conduct the ARDL bound co-integration test. The findings indicated a short-term and long-term positive link between Nigeria's real GDP and unemployment.

MATERIALS AND METHODS

The data have been sourced from World Development Indicators, encompassing the periods from 1991 to 2024. Panel data has been utilized to explore the effects of economic factors influencing unemployment in South Asian developing nations. Bangladesh, India, and Pakistan have been selected as representatives of these countries for our analysis. The study emphasizes six critical macroeconomic variables: Unemployment (total % of the labor force) as modeled by ILO estimates, GDP growth (annual %), Population growth (annual %), net inflows of foreign direct investment (% of GDP), Inflation (annual %, GDP deflator), and Value added by industries (annual % growth). To evaluate the stationary characteristics of the panel data, we used the Levin-Lin-Chu and Im-Pesaran-Shin (IPS) panel unit root tests. To investigate the cointegrating relationships among the variables, the Pedroni cointegration method was employed to determine the panel variables' long-term correlations. In the end, the variables were analyzed using a panel ARDL (Autoregressive Distributed Lag) model, which considered both short-term and long-term correlations throughout time among the three nations

(Bangladesh, India, and Pakistan).

The outcomes of the panel unit root test (Levin-Lin-Chu and Im-Pesaran-Shin) indicate that the panel data utilized in this model demonstrates stationarity at their first difference values, both with an intercept and both the intercept and the trend. Given that the panel data shows stationary results at their first difference values, this study prompts us to examine panel cointegration (Pedroni residual cointegration test) and subsequently to explore the Panel ARDL approach.

The model used in this research has been formulated as follows:

$$UR_{it} = \beta_0 + \beta_1 (GDPg)_{it} + \beta_2 (PG)_{it} + \beta_3 (FDI)_{it} + \beta_4 (IVD)_{it} + \beta_5 (INF)_{it} + \mu_{it} \dots \dots \dots (i)$$

Where, UR = Unemployment rate, GDPg = GDP growth, PG = population growth, FDI = Foreign Direct Investment net inflows, and IF = Inflation rate, IVD = Industrial Value Added.

In the econometric panel regression model presented above, ‘i’ denotes the cross-section data while ‘t’ signifies the observations from the time series. Various econometric techniques have been applied to examine the data, including testing for panel unit roots, the Pedroni cointegration test, and a panel ARDL test. All of these tests have been conducted using EViews software.

Panel Unit Root Examination

3.1 Levin, Lin, & Chu (LLC) Test (Pooled Regression):

Levin and Lin (1992, 1993) along with Levin, Lin, and Chu (2002) present new findings regarding panel unit root tests. The Levin, Lin, and Chu method for panel unit root starts with the pooled regression and then uses an adjusted pooled t statics for ρ. The general model used in the Levin, Lin, and Chu panel unit root technique is as follows:

$$y_{i,t} = \partial_i + \rho y_{i,t-1} + \sum_{j=1}^p \theta_{ij} \Delta y_{i,t-j} + \epsilon_{i,t} \dots \dots \dots (ii)$$

The primary focus is to evaluate the null hypothesis concerning the panel unit root issue, H0: ρ=1 (Common Unit Root), Unlike the alternative hypothesis: H1: ρ<1 (Common stationary). Should the null hypothesis be rejected at the 5% level of significance, whether at the level or first differences of the variables, it indicates that the variables are stationary, allowing us to advance to the Pedroni cointegration and panel ARDL test.

3.2 Im, Pesaran, & Shin (IPS) Test (Average of t-stats):

The t-bar statistic, which enables the simultaneous analysis of stationary and non-stationary series, is a new, more adaptable, and computationally efficient method for unit root testing in panels introduced by Im, Pesaran, and Shin (2003) (henceforth referred to as IPS). The average of each individual t-statistic (ti) from the ADF regression is used in the IPS test. The Im, Pesaran, and Shin panel unit root test uses the following general model: $t_{bar} = (1/N) \sum_{(i=1)}^N t_i \dots \dots \dots (iii)$

The primary focus is to evaluate the null hypothesis concerning the panel unit root issue, H0:ρ=1 (For all i), in contrast to the alternative hypothesis: H1:ρ<1

(For some i). Should the null hypothesis be rejected at the 5% significance level, whether at the level or first differences of the variables, it indicates that the variables are stationary, allowing us to advance to the Pedroni cointegration and panel ARDL test.

Pedroni Panel Cointegration Test

This analysis employs the Pedroni (1999, 2004) cointegration test to assess the existence of a long-run equilibrium relationship among the panel variables. By permitting individual-specific intercepts and slope coefficients, the Pedroni test takes heterogeneity across cross-sectional units into account. It offers a set of test statistics that are divided into between-dimension (group statistics) and within-dimension (panel statistics), which together evaluate whether the residuals from the proposed cointegrating regression are stationary. The rejection of the null hypothesis of no cointegration would imply a statistically significant long-term connections among the variables in question. The general cointegration regression is articulated as: $y_{it} = \alpha_i + \gamma_i t + \sum_{(m=1)}^M \beta_{mi} X_{mit} + \epsilon_{it} \dots \dots \dots (iv)$

In this context, yit represents the dependent variable, while xmit denotes the independent variables for individual i at time t. The term αi signifies the individual fixed effect, γit indicates the individual time trend, βmi refers to the heterogeneous slope coefficients, and εit is the error term. Pedroni introduces seven test statistics to evaluate the null hypothesis of no cointegration (H0: εit contains a unit root) in contrast to the alternative hypothesis of cointegration (H1: εit is stationary). These statistics are divided into two categories: Within-dimension (panel statistics): Panel v-statistic, Panel ρ-statistic, Panel PP-statistic (non-parametric), Panel ADF-statistic (parametric). Between-dimension (group statistics): Group ρ-statistic, Group PP-statistic, Group ADF-statistic

Panel ARDL Test

To examine the long- and short-term dynamics within our panel data, we employ an ARDL model utilizing pooled Mean Group (PMG) estimators.

The standard ARDL model presented in panel format is: $y_{it} = \sum_{(j=1)}^p \alpha_{ij} y_{(i,t-j)} + \sum_{(k=0)}^q \beta_{ik} x_{(i,t-k)} + \mu_i + \epsilon_{it} \dots \dots \dots (v)$

This can be reformulated in an error-correction model’s (ECM) structure: $[\Delta y]_{it} = \phi_i (y_{(i,t-1)} - [\partial x]_{(i,t-1)}) + \sum_{(j=1)}^p (1-\rho) \lambda_{ij} \Delta y_{(i,t-j)} + \sum_{(k=0)}^q (1-\delta) \delta_{ik} \Delta x_{(i,t-k)} + \mu_i + \epsilon_{it} \dots \dots \dots (vi)$

where: φi is the coefficient for error correction, indicating the rate of adjustment toward long-term equilibrium, ∂ represents a vector of parameters for the long run, λij and δik encapsulate the dynamics of the short run. The basic model is specified as

$$UR_{it} = \delta + \alpha_1 [(GDPg)]_{(i,t-1)} + \alpha_2 [(PG)]_{(i,t-1)} + \alpha_3 [(FDI)]_{(i,t-1)} + \alpha_4 [(IF)]_{(i,t-1)} + \alpha_5 [(IVD)]_{(i,t-1)} + \epsilon_{it} \dots \dots \dots (vii)$$

This equation illustrates the long-term connection among

the variables. The complete panel ARDL model can be expressed as

$$UR_{it} = \alpha_i + \sum_{j=1}^p \lambda_{ij} \Delta[UR]_{(i,t-j)} + \sum_{j=1}^q \gamma_{1ij} \Delta[GDPg]_{(i,t-j)} + \sum_{j=1}^q \gamma_{2ij} \Delta[PG]_{(i,t-j)} + \dots + \sum_{j=1}^q \gamma_{5ij} \Delta[IVD]_{(i,t-j)} + \epsilon_{it}$$

where i indicates the cross-sectional units (such as countries), t is the time index (1991-2024), α_i embodies individual-specific effects, and ϵ_{it} denotes the error term. The relevant short-run error correction model (ECM) is formulated as:

$$\Delta UR_{it} = \alpha_i + \phi_i ([UR]_{(i,t-1)} - \lambda_1 [GDPg]_{(i,t-1)} - \lambda_2 [PG]_{(i,t-1)} - \dots - \lambda_5 [IVD]_{(i,t-1)}) + \sum_{j=1}^p \lambda_{ij} \Delta[UR]_{(i,t-j)} + \sum_{j=1}^q \gamma_{1ij} \Delta[GDPg]_{(i,t-j)} + \sum_{j=1}^q \gamma_{2ij} \Delta[PG]_{(i,t-j)} + \dots + \sum_{j=1}^q \gamma_{5ij} \Delta[IVD]_{(i,t-j)} + \epsilon_{it}$$

$$+ \sum_{j=1}^p \lambda_{ij} \Delta[UR]_{(i,t-j)} + \sum_{j=1}^q \gamma_{1ij} \Delta[GDPg]_{(i,t-j)} + \sum_{j=1}^q \gamma_{2ij} \Delta[PG]_{(i,t-j)} + \dots + \sum_{j=1}^q \gamma_{5ij} \Delta[IVD]_{(i,t-j)} + \epsilon_{it}$$

In this formulation, ϕ_i serves as the error correction coefficient, denoting the speed at which the system adjusts departures from the long-run equilibrium. A significantly negative ϕ_i affirms the presence of an enduring partnership (cointegration) between UR and its regressors (GDPg, PG, ..., IVD).

RESULTS AND DISCUSSION

The findings of the panel unit root test conducted using

Table 1: Panel Unit Root Test

Variables	Methods	Level (Intercept)		Level (Trend and Intercept)		First Difference (Intercept)		First Difference (trend and Intercept)	
		Statistics	Prob.	Statistics	P value	Statistics	P value	Statistics	P value
FDI	Levin, Lin & Chu t*	0.72069	0.2356	0.44115	0.6704	-3.85221***	0.0001	-3.00802***	0.0013
UR	Levin, Lin & Chu t*	1.21171	0.8872	0.92502	8.225	-6.25329***	0.0000	-5.74335***	0.0000
IF	Levin, Lin & Chu t*	-2.28134	0.0113	-1.93550	0.0265	-6.63819***	0.0000	5.42188***	0.0000
IVD	Levin, Lin & Chu t*	-2.09242	0.0182	-7.30861	0.0000	-7.30861***	0.0000	-5.21624***	0.0000
GDPg	Levin, Lin & Chu t*	-4.17330	0.0000	-3.96025	0.0000	-6.72684***	0.0000	-6.17905***	0.0000
PG	Levin, Lin & Chu t*	-0.69229	0.2444	0.24438	0.5965	-3.36640***	0.0004	-2.38735***	0.0085

Source: Authors' estimation

the Levin, Lin, and Chu method reveal that all variables are static at their initial difference values, both with and without trend and intercept. Given that the first difference

values demonstrate the stationarity of the variables, we can move forward with the cointegration test. This has been executed through the Pedroni cointegration test

Table 2: Panel unit root test

Variables	Methods	Level (Intercept)		Level (Trend and Intercept)		First Difference (Intercept)		First Difference (trend and Intercept)	
		Statistics	Prob.	Statistics	P value	Statistics	P value	Statistics	P value
FDI	Im, Pesaran and Shin W-Stat	-0.72069	0.2356	0.44115	0.6704	-3.85221***	0.0001	-3.00802***	0.0013
UR	Im, Pesaran and Shin W-Stat	1.21171	0.8872	0.92502	0.8225	-6.25329***	0.0000	-5.74335***	0.0000
IF	Im, Pesaran and Shin W-Stat	-2.28158	0.0113	-1.93550	0.0265	-6.63819***	0.0000	-5.42188***	0.0000

IVD	Im, Pesaran and Shin W-Stat	-2.09242	0.0182	-0.76111	0.2233	-7.30861***	0.0000	-5.21624***	0.0000
GDPg	Im, Pesaran and Shin W-Stat	-4.17330	0.0000	-3.96025	0.0000	-6.72684***	0.0000	-6.17905***	0.0000
PG	Im, Pesaran and Shin W-Stat	-0.69229	0.2444	0.24438	0.5965	-3.36640***	0.0004	-2.38735***	0.0085

Source: Authors' estimation

procedure. The findings from the panel unit root test, executed using the Im, Pesaran, and Shin W-Stat (IPS) method, indicate that all variables exhibit stationarity at their first difference values, both with and without trend and intercept. Given

that the variables demonstrate stationary characteristics at their first difference values, we can move to test for cointegration among the variables. The cointegrating relationships have been analyzed using the Pedroni

Table 3: Panel Cointegration Test (Pedroni Residual Cointegration Test)

Newey-West automatic bandwidth selection and Bartlett kernel (Specified lag length: 1 Alternative hypothesis: common AR coeffs. (within-dimension))				
			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-1.062225	0.8559	-0.853806	0.8034
Panel rho-Statistic	-1.512092**	0.0453	-1.835134**	0.0332
Panel PP-Statistic	-11.35382***	0.0000	-9.871719***	0.0000
Panel ADF-Statistic	-4.244176***	0.0000	-3.563778***	0.0002
Alternative hypothesis: individual AR coeffs. (between-dimension)				
Group rho-Statistic	-2.123768**	0.0168		
Group PP-Statistic	-14.11164**	0.0000		
Group ADF-Statistic	-2.767106**	0.0028		

Source: Authors' estimation

cointegration procedure. The insights of the Pedroni cointegrating test presented above show a total of 7 tests and 11 test statistics. Given that all test statistics, with the exception of the panel v statistics, demonstrate a rejection of the null hypothesis

(H0: No cointegration), and considering that 9 out of the 11 test statistics are statistically significant, we can therefore conclude that the series exhibits cointegration and long-term equilibrium relationships between the

Table 4: Panel ARDL Results

Dependent Variable: D(UN) Method: ARDL Sample: 1995 2024 Included observations: 90 Maximum dependent lags: 4 (Automatic selection) Model selection method: Akaike info criterion (AIC) Dynamic regressors (4 lags, automatic): PG IF IVD GDPg FDI Fixed regressors: C Number of models evaluated: 16 Selected Model: ARDL (4, 4, 4, 4, 4)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
PG (Population Growth)	0.279576***	0.034670	8.063831	0.0000
IF (Inflation Rate)	-0.213069***	0.026676	-7.987206	0.0000
IVD (Industrial Value Added)	-0.017059***	0.002368	-7.203837	0.0000
GDPg (GDP Growth rate)	0.120268***	0.015093	7.967984	0.0000

FDI (Foreign Direct Investment)	-0.075293***	0.009399	8.010174	0.0000
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Source: Authors 'estimation

variables are present.

The table presented above illustrates the long-term outcomes of the panel ARDL model. The estimated results indicate that the inflation rate, industrial development, and foreign direct investment exert a long-term inverse impact on the unemployment rate in developing economies such as Bangladesh, India, and Pakistan. Holding other factors constant, a 1% increase in the inflation rate results in a 0.21% fall in the unemployment rate of these developing nations. Likewise, a 1% enhancement in industrial value addition leads to a 0.017% reduction in unemployment, and a 1% escalation in FDI net inflows decreases unemployment by 0.075% in these developing countries. Conversely, population growth and GDP growth rate have been found to be positively associated with the unemployment rate in these three nations. In particular, a 1% escalation in the population growth rate raises the unemployment rate by 0.28%, while a 1% rise in the GDP

growth rate leads to a 0.12% rise in the unemployment rate, ceteris paribus. The table presented above illustrates the short-term outcomes of the panel ARDL estimation. It has been determined that all variables, with the exception of Industrial Value Addition, exhibit an inverse correlation with the unemployment rate in the three developing countries: Bangladesh, India, and Pakistan. Conversely, Industrial Value Addition is observed to have an insignificant positive effect on the unemployment rate in these three nations in the short term. In the short run, a 1% rise in the population growth rate leads to a 0.095% fall in the unemployment rate, a 1% escalation in the inflation rate corresponds to a 0.038% decline in the unemployment rate, a 1% rise in GDP growth rate corresponds to a 0.35% reduction in the unemployment rate, and a 1% escalation in FDI net flow causes to a 0.09% decline in the unemployment rate across these three countries.

Table 5: Short run relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short Run Equation				
COINTEQ01	-0.059535	0.057048	0.057048	0.3080
PG (Population Growth)	-0.094668**	0.046883	-2.019239	0.0491
IF (Inflation Rate)	-0.038030**	0.013959	-2.797763	0.0421
IVD (Industrial Value Added)	0.076269	0.144783	0.526780	0.6036
GDPg (GDP Growth rate)	-0.348793**	0.151607	-2.300639	0.0452
FDI (Foreign Direct Investment)	-0.093793**	0.041501	-2.260039	0.0331

Source: Authors 'estimation.

CONCLUSION

Unemployment is viewed as one of the most urgent challenges that any nation faces. As a result, this paper has been formulated to identify the factors that influence unemployment rates in developing countries like Bangladesh, India, and Pakistan. The panel data has been validated to be stationary through LLC and IPS tests. The Pedroni cointegration test demonstrated that the variables are cointegrated, and the panel ARDL results indicated that FDI inflow, inflation, and industrial value-added play a role in reducing unemployment in these countries over the long term, while GDP growth and population growth are positively linked to increasing unemployment. Conversely, the short-run coefficients suggest that all variables (except IVD) are negatively correlated with the unemployment rate in these nations.

As unemployment causes various challenges in developing countries, the governments of these nations may consider pursuing an expansionary fiscal policy, which could involve lowering tax rates on personal income and corporate profits or increasing government spending on infrastructure projects to stimulate consumption and investment, ultimately leading to job creation. In terms of monetary policy, governments might decide to increase the money supply to lower interest rates, thereby fostering investment and job opportunities. As part of supply-side policies, the governments of developing nations may implement measures to enhance labor market efficiency, aiding small, medium, and micro enterprises (SMMEs), thereby encouraging job creation.

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