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The Impact of Female Education, Trade Openness, Per Capita GDP, and Urbanization on Women's Employment in South Asia: Application of CS-ARDL Model

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Abstract: This study examines the impact of female education and other control variables such as trade openness, per capita GDP, urbanization, and male employment on women's employment opportunities in South Asian countries. The annual data from 1990 to 2020 were evaluated. After determining the existence of slope heterogeneity, cross-sectional dependence, and mixed order stationary in the panel data, the paper applied the Cross-Sectional Autoregressive Distributive Lag (CS-ARDL) model to estimate long and short-run impacts. At the same time, AMG, MG, and CCEMG models have been utilized for checking robustness and validating the findings. According to CS-ARDL findings, female education and trade openness have a significant positive impact on female employment in the short and long term. In contrast, GDP per capita and urbanization are diminishing female employment in the targeted countries in the long run. The AMG, MG, and CCEMG results support the CS-ARDL findings. This shows that these governments should incorporate trade and education for women into their labor strategies. The key contribution of this study is in the field of labor market opportunity for female employment and shows the relative importance of education in determining female employment in South Asia.

Keywords: female education; female employment; labor economics; trade openness; CS-ARDL

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1. Introduction

According to Rodrik [1], economic integration and social disintegration must be balanced in order to enhance economic growth, and policymakers must also support those who bear the distributive costs of economic interdependence. In many developing nations, men and women vary in education, employment, and health, all human capital indicators. As a person's human capital increases, so do their skills and capacities. In certain developing nations, men and women have varying education levels. Men and women have fewer career options and earn less money in most underdeveloped nations [2].

Much of the research examines how the education gap impacts on women. Women's education affects family and societal health. Multiple reasons make it important. First, education boosts women's economic production. Second, it encourages school attendance, which makes kids smarter. Education starts with literacy. It provides women with the ability to control their lives. More literate people will have greater job prospects. This improves women's standing. Women's attendance at school has increased significantly throughout South Asia over the last several decades, although their percentage remains low despite the fact that UNESCO has worked to increase female enrolment. Compared to women, men's educational attainment is better than that of women. Economic theories, on

the other hand, place a strong emphasis on the empowerment of women. Most economic presumptions about the impact of modernization on economic growth and wellbeing fail to distinguish between men and women.

In contrast, mainstream trade theories imply that growing global trade should have an advantage for women, mainly those in developing countries where unskilled labor is their primary asset. Feminist scholars frequently argue that traditional economic theories and methods do not adequately address the differences between men's and women's views of economic relationships. To put it another way, they do not focus on gendered social norms or the gendered power structure [3]. Scholars such as these are looking for alternative models based on alternative norms, such as sympathy and human connection [4]. They say that supportive and extra-nonprofit-oriented standards of behavior and philanthropic motivation seen in unpaid sectors (such as volunteer work) go against the assumptions that neoclassical theories are based on, such as the idea that people act in ways that maximize their own utility. Women and men have different ties to the market because they do different amounts of paid and unpaid work [5].

Whatever macro factors are behind the question of why fewer women are working, the unemployment rate of women, their level of education, the pace of urbanization, migration from rural to urban regions, and the fertility rate are all factors. On a micro level, education, age, marriage, and children determine the participation rate. Equal pay lowers the number of working women, and women earn less per hour than men [6]. The number and quality of workers are the keys to economic growth and development [7]. Economic growth is the most significant determinant in determining how many women work, say Tansel [8]. Ozerkek [9] examines unemployment and labor force participation in European nations. High unemployment rates indicate that costs are high, which means employees are not utilized as much as they might be. Unemployment affects economic growth and development indirectly. Education has an impact on the number of workers as well. van Stel et al. [10] and Liu et al. [11] utilize education to explain women's employment and also demonstrate that educated women make more money, which boosts overall expenditure. Promoting women's rights and making it simpler for them to access resources and education can boost economic development.

Moreover, the key objective of this research is to analyze the impact of education on female employment with respect to other economic determinants. Some specific goals include assessing the impact of education on female employment as well as the effects of GDP, urbanization, and male labor forces on female employment. At the same time, this study aims to apply advanced econometric methods to estimate reliable results and output. We have used the CS-ARDL approach to look at the effects of female education on female employment in South Asian nations while considering other factors such as GDP per capita, urbanization, and male labor forces. Under the CS-ARDL hypothesis, GDP per capita, urbanization, female education, and the male labor force in South Asian nations are evaluated for their dynamic links. We have also used AMG, MG, and CCEMG tests to check the robustness of the results. The next sections of this study on "theoretical and empirical framework", "data and methodology", "results", and "conclusions and recommendations" all provide an overview of the findings.

2. Literature Review

The following hypotheses have been presented based on the foregoing discussion and previous research.

H1. *Female education promotes female employment.*

H2. *Trade openness promotes female employment.*

H3. *GDP per capita decreases female employment.*

H4. *Urbanization boosts female employment.*

H5. *Male labor force boosts female employment.*

Most economic theories and research demonstrate that economic integration boosts growth (e.g., Klasen [12] and Sachs et al. [13]. Each state can focus on its strengths by allowing free movement of goods, capital, and services. Countries may create inexpensive export items and import cheaper imports. Exporting offers a larger market and allows firms to specialize and leverage economies of scale. This allows companies to better utilize their resources and be more productive, raising national production and real income. People may purchase more with less money. Trade helps disseminate new technology, which is crucial for developing nations that can learn from industrialized governments. Most economists agree that trade openness and trade flows are good for the economy as a whole [14–17]. However, experts still do not agree on whether or not everyone, even the poorest people, will obtain assistance from a growing economy. If the income growth of the poorest fifth of the population approximately matches the national growth Kraay [18], which is a questionable finding Lundberg [19], then trade openness, which is a factor in economic growth, could indirectly help reduce poverty. Several studies on how globalization affects the way people's incomes are distributed Bussmann et al. [20] back up this conclusion by showing that trade openness (and, in some studies, foreign direct investment) does not always make incomes in a state more unequal. When there is more competition, the prices of goods go down. This shifts money from producers to consumers.

On the macro level, trade openness could help women in two ways: on the macro level, the state would make more money; on the micro level, women would make more money [21].

First and foremost, greater access to foreign trade could bring a state more revenue, allowing it to provide more public goods and social services to citizens. If more trade generates more revenue for the government, it alters the government's aptitude to meet the needs of the people, such as social protection, schools, and health facilities. There are those who believe that as the world becomes more globalized, states and politicians will have less and less power over various economic actors. Trade openness has a positive and significant impact on the participation of women in the workforce in South Asian countries, according to Voumik [22]. Trade, on the other hand, has a positive impact on government spending and consumption as a percentage of GDP, according to Rodrik [1]. According to him, the level of demand for compensation increases whenever there is greater freedom of trade. People who might lose out because of globalization can be made whole through the redistribution or the stipulation of public goods. Additionally, for their workers to be able to compete in a global market, states have to give them the infrastructure and education they need [23]. Investing in public goods such as education and health care will not only make an economy more competitive, but it will also improve everyone's well-being and level of happiness. International trade brings in a lot of money for governments, especially those in developing countries. Second, international commerce may provide women with additional employment, which would improve their education and health care (for both men and women). Trade can bring in more money for the government and provide employment for women, which is vital. From a small-scale perspective, women's well-being may increase when they enter the job market. Exports create employment. Exports provide more women with jobs. When women worked more, their pay increased regardless of industry. This larger income allows mothers to pay for their health care and their children's education, and some women may receive health insurance via formal employment. Women with industrial employment may delay marriage and having children, which is excellent for their health and enables them to go to college [24]. Despite working outside the home, women perform most housework and child care. Longer working hours Elson [25] and less time for care and recreation create a double strain [26]. Pampel and Tanaka [27] studied women's employment in 70 countries from 1965 to 1970. Along with economic progress, familial, societal, and demographic factors determine women's position.

Tansel [8] examines women's employment in 67 Turkish regions in 1980, 1985, and 1990. The unemployment rate damaged female employment, while economic expansion and education helped. Women are expected to work more in rural agriculture. These

careers for women pay little or nothing. Women should receive more education when agriculture loses importance so they can work in other sectors. Women's employment share is positively linked to economic expansion [28,29]. Tansel [8] states that the reduction in female work is driven by a drop in rural population, demographic difficulties, and women spending less time in education than males, sector discrepancies, unfair pay, and retirement concerns in Turkey. He argues that more individuals in education will slow job market entry. Another factor in the decline is agricultural employees leaving for non-agricultural jobs. Agricultural labor pays less than other occupations, so more women work there. More individuals work in low-paying occupations than in skill-intensive ones. The Voumik [22] study utilized the human capital-augmented growth model to study economic growth. Population growth, technical advancement, economic efficiency, and physical and human capital are independent factors. In the job market, women with greater talents are more valued than men since they lack fewer fundamental abilities. Less human capital may limit economic progress. More women will enter the workforce if gender disparity improves, boosting economic development.

Education level affects a woman's work prospects. Hence, men are more educated than women; hence, their job output is greater [30]. Women with less education work in low-paying or unpaid occupations. Women and men who perform the same task are paid differently, which is gender discrimination. Women are frequently paid less than men. Innovation and productivity rise with more skilled labor. Qualified people with high academic requirements should acquire jobs. As education improves, more creative individuals will enter society. As innovation improves, various segments of the economy might adopt new technology standards [31]. This promotes growth. Women's education affects economic growth and she contributes to the economy. In addition, the mother's education influences her children and other family members. Investing in education helps an economy flourish. Baliamoune-Lutz and McGilivray [32] examined the relationship between growth and women's employment in sub-Saharan African and Arab nations. The research found a negative connection between women entering the workforce and development in the identified nations. Klasen and Lamanna [33] studied how education and occupations impacted economic development from 1960 to 2000. Inequalities in employment and education between men and women hampered economic progress. Lee et al. [34] studied the connection between birth rates, women's employment, and economic development from 1980 to 2008. Changes in women's employment and childbearing rates influenced EU growth rates by 15%, more than East Asian nations (10 percent). Education also boosts the female labor-force participation rate. According to human capital theory Becker [35], going to school is an investment in human capital. The more individuals who study in school, the more skilled, informed, and valuable they will be in society. So, education affects mortality rates, birth rates, children's education, economic distribution, and birth life expectancy. Schultz also discusses the morality of seeing education as an investment in people and proposes viewing its output as capital. He views education spending as an investment, not a future expense. Denison studied how education influences economic progress. Education boosts the skills and marginal productivity of the work force, which boosts economic growth.

Whatever the case, Hogor and Smits [36] studied how socioeconomic, cultural, demographic, and regional variables impact on school attendance. They employed bivariate cross-tabulations and multivariate logistic regression to study family history and school attendance. Educational involvement was measured by a child's primary and secondary school attendance. According to these data, getting students, particularly females, to attend school is difficult in Turkey. The rural areas and the east have the most out-of-school youngsters. Parental education, the number of siblings, family income, the father's work, and the mother's traditionalism all impact on involvement. In addition, gender education gaps may hamper economic development [37]. It might reduce births and the number of jobless women, which harm human capital. Barro examines the link between economic development and inequality from 1965 to 1995. Inequality slows development in impoverished nations but speeds it up

in prosperous ones. Lagerlof [38] argues that teaching women will reduce childbirths and deaths and educate the next generation. Knowles [39] thinks gender disparity diminishes human capital, hurting the economy. Using a Solow framework, he determined how the gap in education between men and women influences GDP per capita. Finally, gender disparities in education have an impact on per-person GDP.

However, the research gap states that women's enrolment in education and the workforce is rarely investigated in the study area. There is also a lack of discussion about the role of women's education and employment in the South Asian literature. In conclusion, the involvement of South Asian countries in education and employment would result in novel effects. This information can be used by policymakers in these countries to improve their education and employment programs. Geographical proximity, trade, bilateral projects, financial aid/loans, and other types of economic integration connect South Asian countries. The slope heterogeneity and cross-sectional dependence may exist in panel data, which could lead to skewed conclusions. They have been disregarded in previous studies on trade openness, female enrolment in education, and female employment. This study used contemporary econometric approaches to deal with slope heterogeneity, cross-sectional dependency, mixed order stationarity, and endogeneity. The findings of this study are consistent with previous studies on the connections between urbanization, economic growth, and female employment, as well as the connections between education and female employment. Incorporating the interactional terms of urbanization, GDP per capita, education, trade openness, and the influence of the male labor force on the female labor participation rate, the present study contributes to the existing body of research. Urbanization, GDP, and women's employment have previously been argued to be unrelated, but this study explores this relationship in a thorough manner to identify effective policy tools for achieving research objectives.

3. Methodology

3.1. Data

In this section, with data availability ensured by World Bank publication (WDI), the data for all the selected factors were collected from this source. There are several factors that are used in an econometric model and details are shown in Table 1. The statistical measurement known as descriptive statistics is shown in Table 2. Descriptive statistics are incorporated with the several criteria such as mean value, standard deviation, minimum and maximum value, which demonstrate the strength of the data series.

Table 1. Variables' in used form.

Variable Name	Log Form	Indicators' Name
Female labor force	LFLF	Female labor force participation (Rate)
Female Education	LFE	Female enrolment in education
Trade Openness	LTO	Trade (% of GDP)
GDP per capita	LGDPpc	GDP per capita (current US$)
Urban population	LURBA	Urban population (% of the total population)
Male labor force	LMLF	The participation rate of men in the labor force

Table 2. General Statistics.

Variables	Mean	Std. Dev.	Min.	Max.
LFLF	3.525	0.531	2.526	4.416
LFE	13.24	2.625	9.828	18.07
LTO	3.976	0.548	2.843	5.215
LGDPpc	6.719	0.925	4.766	9.198
LURBA	3.206	0.327	2.217	3.840
LMLF	4.399	0.0669	4.209	4.508

3.2. Theoretical Framework

Formal education is essential to a person's ability to succeed in a certain career or work function. An educated population is crucial to the development of a country's various economic sectors. Education enhances a person's creative capacity, which is essential for finding work or starting your own business. In addition to building self-esteem, self-awareness, and a sense of independence, education also enables pupils to have a better understanding of the larger world. In certain circumstances, education directly or indirectly encourages women to enter the workforce and generate an income. A country's economic well-being and trade openness can have an impact on employment, even if its citizens have a good education. When it comes to working outside the home, women have been reluctant to do so for many centuries. Because of a lack of opportunities, South Asian women have not had the opportunity to work in the service or manufacturing industries. Women in South Asian countries have lower wages than men in the majority of countries. Because of the factors outlined above, it has become easier for more people to find work in both the formal and informal sectors. Women's participation in the workforce can assist in boosting economic growth, cutting poverty rates, and improving gender equality by improving access to education. This study develops a theoretical framework that shows that environmental degradation is influenced by elements such as tourism, trade openness, GDP per capita, access to electricity, and urbanization.

3.3. Econometric Methodology

The study relies on panel configurations for the data. Because the number of T in this study exceeded the number of N, a panel cointegration analysis was used. Our study covers eight countries and three decades in scope. Usual panel data cannot be used if T > N because they are more apposite when N is larger than or equivalent to the size of the panel [40]. The primary goal of this article was to scrutinize the impact of female enrollment in education as well as male labor force participation, openness in trade, urbanization, and GDP per capita on female employment in the labor force. To investigate the nature of the long-term connection, this research utilized CS-ARDL and Westerlund and Edgerton [41] panel cointegration experiments. The study also used the MG, AMG, and CCEMG approaches in South Asian countries between 1991 and 2019 to verify robustness. As a first step, we verified the assumption of slope homogeneity through a series of experiments. Second, the paper looks at panel data for signs of cross-sectional dependencies. Third, we ensured that the data are stationary. In the fourth phase, we performed a test known as the panel cointegration test. Finally, we demonstrated an economic model and an estimation technique based on the results of the previous tests, and we will examine the long-term causal linkages between the variables.

The Equation (1) is the baseline equation:

$$FLF_{i,t} = \alpha + \beta FE_{i,t} + \gamma X_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

The following Equation (2) is the detailed form of Equation (1):

$$FLF_{i,t} = \beta_0 + \beta_1 FE_{it} + \beta_2 TO_{it} + \beta_3 GDPpc_{it} + \beta_4 URBA_{it} + \beta_5 MLF_{it} + \varepsilon_{it} \quad (2)$$

Here,

FLF = Female labor force; FE = Female education; TO = Trade openness; GDPpc = GDP per capita; Urba = Urbanization; and MLF = Male labor force participation.

Log form of Equation (3):

$$LFLF_{i,t} = \beta_0 + \beta_1 LFE_{it} + \beta_2 LTO_{it} + \beta_3 LGDPpc_{it} + \beta_4 LURBA_{it} + \beta_5 LMLF_{it} + \varepsilon_{it} \quad (3)$$

Here, β_0 is the intercept term. $\beta_1, \beta_2, \beta_3, \beta_4,$ and $\beta_{5,}$ are the slope coefficient. The ε shows the residual estimation, i indicates the individual measurement panel unit, and t indicates time.

3.3.1. Slope Homogeneity (SH) Test and CSD Test

When working with panel data, the problem of slope heterogeneity is a key one to consider. This is followed by testing for slope homogeneity with the test of Pesaran and Yamagata [42]. The results of this exam are computed based on the weighted slope of each individual participant. As a result of the testing, the following Equation (4) is the famous SH tests:

$$\check{\Delta} = \sqrt{N}\left(\frac{N^{-1}S\% - k}{\sqrt{2k}}\right) \text{ and } \check{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}S\% - k}{\sqrt{\frac{2k(T-k-1)}{T+1}}}\right) \quad (4)$$

Table 3 displays the results of the SH test developed by Pesaran and Yamagata [42]. However, heterogeneity indicates that the model has a flaw. As a result, the model's coefficients have a wide range of values, and the slope varies depending on the country where it is used. According to the rejection of homogeneity of slope, the panel causality analysis, which requires that the variable of interest be homogeneous, may produce incorrect results. This is because of the assumption that the restriction on the variable of interest is homogeneous. However, cross-sectional dependence in panel data econometrics is also likely to become more prevalent in the current period as economic integration and trade barriers are reduced. This is because of how panel data econometrics analyzes data over time [43]. Without considering cross-section dependence, the information that we receive may be inaccurate, inconsistent, and conflicting because we will be relying on information that is not reliable [41]. For the purpose of this investigation into cross-section dependence, the weakly exogenous cross-section dependence in large-panel data econometrics Pesaran [44] has been utilized. To use the panel-data econometric (CIPS) unit root test, make sure that SH and CSD are present. The formula for the CSD test is available in Equation (5), which is the correlation among the individual panel units. Table 4 displays the CSD results. The estimated null hypothesis is that there is no interdependence among the units used in the panel analysis:

$$CSD = \sqrt{\frac{2T}{N(N-1)N}\left(\sum_{i=1}^{N-1}\sum_{K=i+1}^{N}\hat{Corr}_{i,t}\right)} \quad (5)$$

Table 3. Slope Homogeneity (SH) Test.

SH Tests	Δ Statistic	*p*-Value
$\check{\Delta}$ test	7.241 ***	0.000
$\check{\Delta}_{adj}$ test	8.937 ***	0.000

A test of SH starts with the statement that slope of selected coefficients are all homogeneous. Less than one percent of the population is shown with the *** symbol.

Table 4. Estimated Results of CSD Test.

Variable	Test Statistics
LFLF	13.716 ***
LFE	12.253 ***
LTO	−12.057 ***
LGDPpc	24.826 ***
LURBA	13.686 ***
LMLF	5.64 ***

Note: The significant levels at 1% are indicated by ***.

3.3.2. Unit Root Test

The conventional unit root test, such as Pedroni [45], has the potential to produce false findings due to the existence of slope heterogeneity and cross-sectional dependency [46]. Therefore, in order to determine whether or not the variables in the CSD presence and slope heterogeneity were stationary, we carried out a unit root test of the second generation known as CIPS, which was developed using Pesaran [47]. This allowed us to find out

whether or not the variables were stationary. To obtain a CIPS estimate, we needed to take a cross-sectional average of ti, as shown in the following Equation (6):

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} t_i(N,T) \quad (6)$$

Currently, CIPS plays an important role to test the unit root of a data series due to the presence of CSD and SH. To test the unit root, CIPS needs to follow the "Cross-sectional Augmented Dicky Fuller" (CADF) test. The estimated null hypothesis was data series has unit root. However, the CADF has been calculated by using the following Equation (7):

$$\Delta Y_{it} = +\zeta_i Y_{i,t-1} + \delta_i \overline{Y}_{t-1} + \sum_{j=0}^{P} \delta_{ij} \overline{Y}_{t-1} + \sum_{j=1}^{P} \lambda_{ij} \Delta Y_{i,\,t-1} + \varepsilon_{it} \quad (7)$$

where and are the averages of each individual country's lagged and first difference in a panel unit. Table 5 displays the results of the tests conducted on the CIPS panel unit root. The fact that "some variables are stationary at level I(0) while others are stationary in the first difference I(1)" suggests that they are integrated at the level or first order of integration. The paper used the CS-ARDL and Westerlund [48] approaches because the variables are mixed during integration.

Table 5. Second Generation Unit Root Test.

Variable	CIPS Test	
	At Level	**1st Differences**
LFLF	−0.677	−2.779 ***
LFE	−1.800	−5.625 ***
LTO	−2.549 **	
LGDPpc	−1.433	−2.789 ***
LURBA	−4.939 ***	
LMLF	−0.920	−3.254 ***

Note: The significant levels at 5%, and 1% are indicated by ** and ***, respectively.

3.3.3. Cointegration Testing

A modified form of Swamy's [49] test is used to investigate whether or not slope homogeneity exists, as well as whether or not slope heterogeneity is present. The null hypothesis presumes a homogeneous slope and an alternative heterogeneous slope variable. However, Kao et al. [50] and Pedroni [45] failed to describe CSD when analyzing cross-sectional data. As a result of the data's CSD, heterogeneity, and non-stationarity, a heterogeneous estimate approach is operated to find out whether or not there is co-integration. Heterogeneity in slope, CSD, and correlated errors are all part of the Westerlund and Edgerton [41] approach to data analysis. The Westerlund [48] panel cointegration approach was utilized in this work to find the cointegration links involving the variables of interest. Cointegration qualities in CSD panel data can be accurately predicted using this method. Error correction is used to construct four-panel non-cointegration test statistics. The following Equations (8)–(11) are a general definition of this cointegration assessment, where and are presented in the cointegration form of the analysis and are group mean statistics. The assumed hypothesis declared that there was no cointegration:

$$M_\alpha = \frac{1}{n}\sum_{i=1}^{N} \frac{\acute{\alpha}_i}{SE(\acute{\alpha}_i)} \quad (8)$$

$$M_t = \frac{1}{n}\sum_{i=1}^{N} \frac{T\acute{\alpha}_i}{\acute{\alpha}_i(1)} \quad (9)$$

$$N_t = \frac{\acute{\alpha}}{SE(\acute{\alpha}\,)} \quad (10)$$

$$N_\alpha = T\acute{\alpha} \tag{11}$$

3.3.4. CS-ARDL Test

In order to investigate the CSD and SH issues, this study used a recently developed method known as the CS-ARDL model in conjunction with other three important estimators. This method is based on Westerlund's [48] Panel Cointegration Test. The CS-ARDL test, which was developed by Chudik and Pesaran [51] and is used for both long-term and short-term evaluations in this study, was created by those researchers. This method is superior to others in terms of efficiency and dependability, including the "mean group (MG), the pooled mean group (PMG), the common correlated effect mean group (CCEMG), and the augmented mean group (AMG)." To test for robustness, the authors of this paper used the MG, AMG, and CCEMG models. This method addresses cross-sectional dependence, mixed-order integration in unit root tests, and endogeneity concerns. This is due to the fact that incorrect estimation results will be obtained if common components are not included. The CS-ARDL is represented by Equation (12):

$$LFLF = \alpha_{it} + \sum_{j=1}^{P} \beta_{it} LFLF_{i,t-j} + \sum_{j=0}^{P} \gamma_{it} X_{t-j} + \sum_{j=0}^{3} \delta \overline{Y}_{t-j} + \varepsilon_{it} \tag{12}$$

where $\overline{Y_t} = \left(\Delta\overline{LFLF_t},\ \overline{X_t}'\right)'$ and $X_{it} = (LTO_{it} LGDPpc_{it} LFE_{it} LURBA_{it} LMLF_{it})'$.

4. Results and Discussions

The findings of the SH test of Pesaran and Yamagata [42] and the CSD tests of Pesaran [44] are shown following, respectively. Table 3 shows that the panel has diverse slope coefficients based on statistical significance from the test, which rejects the null hypothesis of slope homogeneity.

Panel data must be checked for the CSD test before beginning an econometric analysis. The findings of the cross-sectional dependency study are presented in Table 4 and it can be seen that every panel of data exhibits symptoms that are consistent with the cross-sectional dependency study. This indicates that FLF, FE, TO, GDPpc, URBA, and MLF all have a cross-sectional dependence on one another as a result of similar economic, social, and political parallels. Because South Asian economies make up a significant portion of the global economy, this is to be expected. Trade and macroeconomic policies and programs are also similar between these two countries. Biased results can be avoided by resolving the CSD and slope heterogeneity issues, which must be addressed. Required tests, such as the panel unit root and cointegration, are carried out after the slope homogeneity and CSD tests have been carried out.

In order to evaluate the relationship over the long term, the research have used the CIPS unit root that was introduced by Pesaran [47], the cointegration methods that were developed by Westerlund [48], and the CS-ARDL method. Before proceeding, ensure that the data have been correctly integrated into the sequence. A unit root test is used for this function, and the results are shown in Table 5. A mixed order of integration has been found for all variables. In other words, FLF, FE, GDPpc, URBA, and MLF are not affected by the same trend as the rest of the economy. The next step in the evaluation of panel data is to test for the stationarity of the variables. Some variables become stationary after the first difference, or I (0), while others only become stationary after one difference, or I (1). The results of this study allow us to draw the conclusion that each of the variables in the analysis is either I(0) or I(1), but not I(2).

After determining whether or not the variables are stationary, the next step is to find out whether or not the long-run variables are co-integrated. This step is taken after determining whether or not the variables are stationary. Using the cointegration tests in Table 6, the results show that null hypothesis can be rejected based on p-values at a 1% significance level. We are able to draw the conclusion that our long-run variables are co-integrated as a direct result of this.

Table 6. Cointegration Tests.

Variable	Westerlund Test for Cointegration	
	At Level	1st Differences
M_t	−4.17	0.00
M_α	−7.52	0.99
N_t	−8.25	0.00
N_α	−3.47	1.00

Furthermore, it can be argued that in the context of South Asian situations, FLF, FE, TO, GDPpc, URBA, and MLF have long-term links. The confirmation of long-run co-integrating correlations meets the requirement of forecasting long-run coefficients using the correct panel regression approach. According to Table 7 the CS-ARDL model includes the long and short-term impacts. However, MG, CCEMG, and AMG estimators are provided by other models that are long-run models and are displayed in Table 8. As a robustness check, an alternative model is used here.

Table 7. Outcomes of CS-ARDL.

Variables	Coefficients	Standard Errors
Short-run results		
LFE	0.0457 **	(0.0460)
LTO	0.0152 *	(0.0185)
LGDPpc	0.0504	(0.0467)
LURBA	−0.0159 **	(0.167)
LMLF	−0.142	(0.196)
Long-run results		
LFE	0.0261 ***	(0.0225)
LTO	0.266 *	(0.159)
LGDPpc	−0.0272 **	(0.189)
LURBA	−1.822 **	(2.113)
LMLF	3.724	(4.259)
R-square	0.344	

Note: The significant levels at 10%, 5%, and 1% are indicated by *, **, and ***.

Table 8. Robustness Tests.

	(1)	(2)	(3)
VARIABLES	**MG**	**CCEMG**	**AMG**
LFE	0.0653 **	0.0159 ***	0.0513 **
	(0.0608)	(0.0596)	(0.0908)
LTO	0.0603 *	0.0145 *	0.0353 *
	(0.0395)	(0.0416)	(0.0595)
LGDPpc	−0.0385	0.0527 *	−0.2585
	(0.0918)	(0.0826)	(0.519)
LURBA	−0.166 **	−0.0922 **	−0.186 ***
	(0.293)	(0.359)	(0.225)
LMLF	0.106	−0.221	0.206
	(0.433)	(0.242)	(0.253)
Constant	4.162 **	−7.003	3.242 **
	(2.070)	(6.448)	(2.170)

Note: The significant levels at 10%, 5%, and 1% are indicated by *, **, and ***.

As shown in Table 7's short run estimation, it has been shown that LGDPpc and LURBA have negative impacts; however, LTO has a positive and significant effect, and the coefficient explains that one percent changes in trade openness raise female employment by 0.0152%. It appears from these results that education and employment have a good

relationship. The estimated coefficient of female education is 0.0457, which is positive and significant at the 5% level, implying that a 1% increase in female education raises the female employment rate by 0.047 percent. Kanjilal-Bhaduri and Pastore [52] and Rahman and Majumder [53] found evidence of variable female education to explain female labor opportunity. Apart from LMLF, the CS-ARDL models are statistically significant in the long run. LTO has a positive and significant effect, and the coefficient explains that a 1% increase in trade openness raises female employment by 0.266 percent. According to these findings, education and employment have a positive relationship. The estimated coefficient of female education is 0.026, which is positive and significant at the 5% level, implying that one percent change in female education raises female employment by 0.0261 percent. CS-ARDL estimations have been demonstrated to be endogeneity-resistant by Chudik et al. [51]. Trade openness and educational attainment have a favorable impact on jobs in the short and long term, respectively. However, Table 8 shows that the "mean group (MG), the augmented mean group (AMG), and the common correlated effects mean group (CCEMG)" all have robustness results. The coefficients of CCEMG of 0.0653, 0.0159, and 0.0653 percent show a positive correlation between education enrollment and female employment. On the other side, urbanization and female employment show a negative correlation, with values of 0.166 percent, 0.092 percent, and 0.186 percent for MG, CCEMG, and AMG, respectively. Trade openness, female employment, and correlations of 0.0603 percent, 0.0145 percent, and 0.0353 percent, respectively, are all positively connected. In the case of GDP per capita, the MG and AMG models indicate negative associations with female employment with coefficient values of 0.0385 and −0.01585, respectively; however, the CCEMG model shows a positive correlation. Men's employment is positively correlated with women's employment, with coefficients of 0.106, −0.221, and 0.106. The findings that were generated by the CS-ARDL model have been supported by the results of the robustness check. The findings of the econometric analysis indicate that the number of men in the labor force, the degree of trade liberalization, and the education level of women all have a significant and positive influence on women's employment in South Asian countries which findings are similar to those of Oztunc et al. [54] and Ortega et al. [55]. In order to increase the number of jobs available to women, the government must pay attention to their education. Additionally, more women are employed as a result of increased trade openness. Trade results in job creation and trade can increase income in a number of ways, including by advancing demand, maximizing returns, and bringing output closer to its maximum level, all of which have an effect on employment rates [56]. However, urbanization has no positive impact on women's employment in South Asian countries; the coefficients of urbanization in both short and long run are negative.

5. Conclusions and Recommendations

This study looks at the years 1990–2020 to find out how factors such as female education, male labor force participation, trade, GDP per capita, and urbanization affect the employment of women in South Asia. Second-generation unit root tests, panel cointegration tests, and robustness checks were used to conduct the panel data analysis. We wanted to know how factors such as education, trade, urbanization, per capita income, and the male workforce affect women's employment. Long-term cointegration between education, trade, urbanization, male labor-force participation, per capita income, and employment is supported by empirical evidence. According to our empirical findings, female education in South Asian countries has a statistically significant positive effect on female employment. The findings of our research are crucial for policymakers to consider since they pertain to increasing the rate of female labor force participation and boosting educational opportunities for women. As a result, governments have to place a greater emphasis on enhancing the standards of research institutions and education. In addition to using the findings of the study, policymakers should devise strategies to improve the quality of the product. According to the results of the statistical analysis, the education level of women, the degree to which trade is liberalized, and the number of males in the labor force all have a substantial

and favorable impact on the employment of women in South Asian nations. For this reason, the government needs to pay attention to the education of women in order to increase the number of jobs available to them. In addition, an increase in trade openness also increases the number of women who are employed. Trade produces employment. Exports have the potential to boost income in a number of ways, including by increasing demand, maximizing returns, and increasing output closer to its maximum level, all of which have an impact on employment rates. The growth of imports may result in an increase in the flow of knowledge and other inputs, which may have a positive effect on the labor market. The findings also state that there is a relationship that is both beneficial and significant between the male and female work force, which is why it is recommended to pay attention to labor market inequality and take active measures to reduce wage inequality. This research makes a contribution to the literature on economic development, female education, urbanization, trade openness, and the male labor force by offering fresh empirical data on the ways in which economic activity, education, urbanization, trade openness, and the male labor force are connected to women's employment. Furthermore, the importance of education in determining female employment in South Asia is demonstrated by this study's relevant contribution in the field of labor market opportunity for female employment.

Now, the COVID-19 crisis has shown that a new problem arises when it comes to employing women. The pandemic intensified the challenges for working women. Working women suddenly had "new" responsibilities of educating their children alongside their working and caring roles [57].

The limitations and topics for further study confirm that this issue would be a great research issue for the lower- and lower-middle-income countries, as well as emerging countries such as the N-11 countries.

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