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Does Gender Kuznets Curve Exist in South Asian Countries? Role of Gender Equality and Economic Development

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ABSTRACT

This study aims to determine the relationship between gender equality and economic growth in major South Asian countries. This study suggests checking the gender Kuznets curve or whether the data support a linear, quadratic, or cubic gender Kuznets curve for major South Asian countries. We used time series data and covered the period from 1980 to 2019. We applied the Ng-Perron unit root test to check for non-stationary time series data. After the integration order is established, the autoregressive distributive lag (ARDL) model is used in three steps. The ARDL bound testing approach of covariance shows that Sri Lanka has an S-shaped Gender Cognition Curve (GKC), India has a Z-shaped GKC, Pakistan has an S-shape, and Bangladesh has an S-shape. is the -shaped GKC association. Periods of countries were considered. We also conclude that gender equality is not a direct result of development. Consequently, politicians with gender equality policies should subsidize women's employment in times of financial hardship.

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1. Introduction

The United Nations' Sustainable Development Goals for the year 2030, regularly referred to as SDGs, include a primary objective of enhancing women's empowerment and promoting gender equality (Apostolopoulos, Al-Dajani, Holt, Jones, & Newbery, 2018). These objectives are typically included in the political blueprint and educational structure in most countries. Despite including women's empowerment and gender equality in the United Nations Millennium Development Goals (MDGs), gender disparity persists in almost all countries globally (Ogato, 2013). The interrelationship between economic development and gender is a subject of regular examination and discussion in the economic and political spheres. Participants of many scientific and economic social actions, seminars, and conferences widely recognize the significance of women's empowerment as a crucial matter in both economic and political realms. The importance of gender equality for economic development has been emphasized by reputable institutions such as the World Bank and the International Monetary Fund

(International Monetary Fund. Strategy & Department, 2018). The World Bank also recognizes that gender inequality can hinder the achievement of development goals.

Gender equality implies that men and women are equal in all areas of life. In arguments regarding physical gender, giving men and women different freedoms and responsibilities is genuine. An example is the sole granting of pregnancy leaves to women in the workplace. However, it is crucial to recognize the considerable lifestyle discrepancies between men and women in modern society. These peculiarities cause gender inequality. It's crucial to recognize that women and men behave differently in certain ways. Male firefighter numbers are greater than female ones (Cohn et al., 2021). However, women have substantial obstacles that may deter them from becoming firemen. Gender equality does not mean there should be a 50/50 gender split in all jobs. Some occupations are predominantly done by men or women, demonstrating gender inequality in task performance. Therefore, it is unlikely that men and women must have equal engagement in all sectors merely to obtain equal representation. Gender equality means that men and women should have equal access to resources. Thus, gender disparity refers to uneven opportunity, social treatment, and sex-based perspectives between men and women. The gender gap may affect the economy. Because it limits women's opportunities. Emerging countries are concerned about gender inequality in the workplace and at home. The disparities are shrinking in industrialized nations. In developing nations, economic, social, and political involvement remains unequal. Wong (2012) examined that women are underrepresented in male-dominated economic and industrial sectors. This restrictive climate may hurt women's productivity and profits. Despite progress in women's rights and work participation, women still trail behind men in various areas, contributing to the gender gap in emerging countries (Klasen & Lamanna, 2009).

Gender disparity has been the subject of substantial research across several academic areas (Minasyan, Zenker, Klasen, & Vollmer, 2019). In light of the COVID-19 pandemic, there has been an increased focus on gender disparity due to the potential reversal of earlier advancements in addressing this problem (Kristal & Yaish, 2020). The economic consequences of gender inequality and gender equality have gained significant attention in the field of economics in recent years. A particular focus has been placed on examining the impact of gender equality on economic development, a subject that has been extensively explored by prominent economists (Cuberes & Teignier, 2014). Numerous prior research endeavors have shown the favorable influence of female educational achievement on the advancement of economic development (Altinok, 2007; Dollar & Gatti, 1999; Schultz, 2002). On the other hand, Seguino (2000) examines the potential of women's comparatively lower income, stemming from gender inequality, to catalyze transferring and thereby foster economic development. Despite the existence of several recent empirical studies Bertay, Dordevic, and Sever (2020); Schober and Winter-Ebmer (2011); Seguino (2000) a consent has yet to be reached around the economic consequences of gender disparity or equivalence, particularly concerning their impact on economic growth (Minasyan et al., 2019).

Women are guaranteed different rights in different countries of the world, while the religious, social, financial and political climate of each country plays a key role in influencing how women are treated and provided. It is done at the level of responsibilities and rights. These elements may affect women in negative or positive ways. While female labor participation has enlarged in the last few years gender inequality is not finished. In developing countries, females have fewer opportunities than men (Kilinc, Onater, & Yetkiner, 2015). For India, the ratio of female to male labor contribution is 0.35; for the Maldives, it is 0.53; for Nepal, it is 0.98; for Bangladesh, it is 0.42; for Bhutan, it is 0.79; for Pakistan, it is 0.31; and for Sri Lanka, it is 0.49. The problem is how the female labor force contribution changes throughout the development stages of these advanced economies. Gender labor gaps can impact economic performance in many systems. One observable position emphasized the underutilization of ability related to females' inferior contribution to the labor market (Schwab et al., 2017).

The researcher designs a perfect future situation in which female contributes to the economy equally to men. According to researcher estimations, this can improve an additional United States dollar (USD) 28 trillion $ in 2025 yearly global GDP, associated with an industry-as-usual situation. These numbers get up from finishing altered gaps. For illustration, increasing women's contribution in the labor market financial statement for 54% of the possible rise. Finishing the hole-in periods worked would be generating 23% of the assessed incremental Gross Domestic Product (GDP). As a final point, males tend to be over-represented in higher average production, although women are over-represented in those with lower production parts. So, fluctuating females into locations in higher productivity parts to equal man-sharing designs would improve an additional 23 percent of the entire possible incremental GDP (Krishnan et al., 2020). Applying the idea of Simon Kuznets income inequity and economic development have a curve linear association. In the early step of economic growth, the labor force was a small sector with high wages. So, in this situation income inequality is leading. The economic development improvement, the labor force is high with low wages. So, in this situation income inequality is reduced (Kilinc et al., 2015).

Gender disparity and economic development show a nonlinear association, apparent in three stages. In the first stage, economic developments have to increase gender equality because female labor involvement enlarged. The possibility of growing human resources discusses greater political and common acknowledgment. In another stage, equality would hill or equal deterioration somewhat, and in the final or tertiary stage, it would upsurge over. The authors determine the association between economic growth and gender equivalence is more difficult a conclude through significant policy implications. Somewhat an inverted U shape with two phases, the authors recommend that development belongings on gender equivalence would look like an S form that is organized in three steps, in the first step equality is increasing. After increasing, in the second step equality reduces or decelerates, and finally in the third step equality again increases. The U-shaped model's strategy recommendation urges growth to encourage improvements in gender issues whenever an economic edge is crossed (Eastin & Prakash, 2013). UNDP also set the Sustainable Development Goals from 2015-2030 related to gender equality. Economic, social, and political equality for females was advantage all the world's citizens.

Gender inequality is destructive to economic development. To find the economic development, the researcher takes different countries and the same country in different periods, but the result shows economic growth at such different proportions. So, this study checks the GKC (Gender Kuznets Curve) association between the GDP per worker and gender equality in major South Asian countries. This study is a cross-country comparison of South Asian countries. This effort expresses the Gender Kuznets Curve whether data support linear, quadratic, or cubic shapes for major South Asian countries. This study has the following major research questions:

- Is gender inequality destructive to economic development?
- Is gender equality the direct result of economic development?

The remainder of the study is organized as follows: Section 2 provides a literature review. Section 3 covers the research methods and data. Conclusions and suggestions for future studies follow the presentation of the data in Section 4.

2. Literature Review

The matter of gender inequality has emerged as a frequent subject of discussion among economists and among scientific communities on a global scale. The significance of gender equality on a global scale has been emphasized by the United Nations. Nevertheless, many nations, particularly those in Asia, exhibit a more prominent embodiment of gender disparity. According to the findings of Matthew, Adeniji, Osabohien, Olawande, and Atolagbe (2020) and

Kennedy, Smyth, Valadkhani, and Chen (2017) it has been argued that gender disparity poses significant obstacles to economic growth, as supported by many factors. The existing economic and social framework engenders gender disparities and hinders the inclusion of diverse social groups, hence hindering the attainment of sustainable economic development. According to Klasen (2018), the rationale behind this association may be elucidated as follows: The disparity in educational attainment between genders has a negative impact on the human capital index, thereby impeding economic activity and hindering economic progress. The disparity in educational attainment between genders has a detrimental impact on the human capital index, hence diminishing economic activity and impeding economic progress. Moreover, it is evident that there exists a reciprocal link between gender disparity and economic progress. Indeed, considering the societal framework and the presence of gender disparities, economic progress accentuates the unequal allocation of resources within the economy. The phenomenon generates disparities in accessing employment prospects, thereby exacerbating gender-based inequities. According to Bui, Vo, and Bui (2018) and Cabeza-García, Del Brio, and Oscanoa-Victorio (2018), gender inequality exerts a detrimental influence on economic growth, as evidenced by disparities in educational opportunities and other relevant characteristics. The research highlights the correlation between women's education and its potential impact on reproduction rates and the educational attainment of subsequent generations (Elu, 2018; Kotásková et al., 2018). The findings of this study indicate a positive relationship between women's level of education and their access to employment opportunities. This relationship, in turn, directly affects economic development and ultimately the overall economic development of the affected nations. Increasing female educational attainment has significant effects on several interrelated variables. One such effect is improved health outcomes for their children, which increases the overall level and quality of human capital and labor productivity in future generations. This, in turn, contributes to the growth of economic growth (Mitra, Bang, & Biswas, 2015).

A number of academic studies have reached the consensus that improvements in gender equality in the areas of education, health and labor market prospects have a positive impact on human capital (Berik, Rodgers, & Seguino, 2009; Klasen, 2002; Klasen & Wink, 2003; Knowles, Lorgelly, & Owen, 2002). Several literature have highlighted the idea that investing in the education of girls is expected to provide more incremental benefits compared to investing in the schooling of boys (Knowles et al., 2002). Consequently, promoting gender parity not only enhances the growth of human capital but also contributes to the enhancement of economic performance. Simultaneously, it has been shown that human capital has a significant role in influencing economic complexity (Hartmann, Guevara, Jara-Figueroa, Aristarán, & Hidalgo, 2017; Sadeghi, Shahrestani, Kiani, & Torabi, 2020). The researchers claim that gender dynamics and social reproduction have a crucial role in shaping economic development, particularly in terms of its long-term growth potential. Nevertheless, it is worth noting that women tend to assume the role of caretakers within their families. This involvement in caregiving, whether through direct or indirect care services, may be seen as an crucial contribution in the production method, namely in the preservation of the labor force (Braunstein, Bouhia, & Seguino, 2020).

The enhanced involvement of women in the workforce might consequently have a detrimental impact on the provision of care services and diminish human capacities. Enhancements in several dimensions of gender equivalence, such as health, schooling, and economic and political rights, contribute to the improvement of care facilities provided by women, thus enhancing total human capacities. Furthermore, existing data elucidates that the attainment of gender equality, particularly in relation to female education, has the potential to diminish fertility rates and child mortality rates, while concurrently fostering the educational development of subsequent generations (Klasen & Lamanna, 2009). Gender equality plays a pivotal role in enabling a nation to leverage the economic benefits associated with the comparatively lower cost of female labor, hence enhancing its competitive edge in the realm of export-oriented production (Seguino, 2000). In conclusion, the promotion of gender equality

across several domains such as well-being, schooling, service, and societal rights has been found to contribute to the increased relation negotiating power of women within the context of the family (Klasen & Wink, 2003). The increased bargaining power might potentially lead to positive changes in several aspects of family decision-making, including but not limited to schooling for children, savings, investments, and well-being investments (Seguino & Floro, 2003; Stotsky, 2006). Consequently, the human capital of subsequent generations experiences enhancement. In essence, the promotion of gender equality may provide substantial advantages in terms of economic complexity, particularly through fostering advancements in human capital. According to several studies Berik et al. (2009); Klasen (2002); Klasen and Lamanna (2009); Knowles et al. (2002), it can be argued that improvements in gender equality have a positive impact on the accumulation of human capital in both the present and future generations. The favorable effects of these enhancements in human capital on economic complexity have been demonstrated in previous studies (Lee & Vu, 2020; Zhu & Li, 2017).

Alawin and Sbitany (2019) observed the association among gender inequality and economic development. In this study, 17 countries covered the 1991 to 2015 periods by the panel data model. The finding of the research depicts that there was a linear relationship, it was not a curvilinear association between the life expectancy at birth, economic development, and female employment in services. The authors conclude that a curvilinear association s shapes the Kuznets curve. Danylova and Kats (2019) examine the relationship among gender inequality, public health, and the global economy. The researchers found that there was a negative effect of these variables (global economy, public health, and gender inequality). When gender inequality increases, the consequences are negative for economic growth and development. Although taking the right to appreciate and appreciate their integrity, beliefs, and gender practices. Authors observed a decline in FLFP (Female Labor Force Participation) in India. The data is drawn from 1990 to 2017. In this paper, the researcher used the regression model to discover the effect on the woman labor force contribution of a different element. This study delivers the vision of the U formed function among the economic progress and women's labor force contribution. The scholar finds that the decrease in the WLFC (Woman Labor Force Contribution) in India was attributed to economic progress farming part and urbanization (Jaze & Kaur, 2019).

Verick (2018) observed the varying nature of female contribution in the labor force has a staid factor of progress. The authors find that the growing number of females in the manual labor market and the Industrial Revolution have played a significant role in dynamic economic progress. The data were cross-sectional and specified the weak U-formed association between the FLFC (Female Labor Force Contribution) and the GDP per Capita. This association was not strong. It was not stable at the country level. Kim, Lee, and Shin (2018) observed the impact of gender inequity in Korea on economic growth. The researchers conclude that gender equality strategies that minor discernment in the manual labor market contribution. The finding indicates that inequalities between females and males in the house in the labor market were removed, so in this way, the FLFC (female labor force contribution) proportion rose from 54.4% to 64.5%. So also raised the per capita income progress proportion from 3.6% to 4.1%. Hakura, Hussain, Newiak, Thakoor, and Yang (2016) examined the association between income inequality gender disparity, and economic development. The authors used the time series data and the dynamic panel regressions. This research shows that there was both gender inequality and income inequality negative connection with GDP per capita growth. The researchers conclude that females contribute to economic development. Pradhan, Singh, and Mitra (2015) observed the U formed a relationship between the women's labor force contribution rate and economic growth in India. Both these elements are influenced by education, which increases jobs and say that income was increased. So, the researcher finds a positive relationship between education and economic development.

Kilinc et al. (2015) compared the factors of gender inequality and how they relate to the less development of underdeveloped nations as a cause of gender inequality. This research

covers the 34 countries OECD in the period 1951 to 2010. The research's theoretical level demonstrates the beneficial influence of gender parity on economic development. The researchers originate that the increase in shares of the female labor force has a positive effect on economic development. Mujahid and uz Zafar (2012) observe the connection between the FLFC (Female Labor Force Contribution) and economic progress. The authors used the ARDL bounds test or autoregressive distributed lag modeling. The authors also conclude that when economic activity and education increase in the country then this has a positive effect on the women's labor market. Tam (2011) observed the connection between economic growth and the FLFC (Female Labor Force Contribution). This study covers 130 countries over 31 years. The researcher's estimate makes dynamic panel data. The conclusion of this research holds the U-formed pattern in the connection between economic growth and the FLFC (Female Labor Force Contribution). Ashraf, Karlan, and Yin (2010) examine women's empowerment and development goals. The researcher finds that attaining the progress goals was increased women's empowerment. This research used a randomized controlled trial. The authors conclude the positive effect of women's empowerment and the development goal. Also gradually increase the decision-making authority within the family circle.

2.1. Theoretical Framework

Researchers have been involved in a general argument about the association between economic development and females' economic, political, and social status. Studies cite samples taken out as economic progress of FLF (female labor force) rises man earnings. This procedure forces females to leave the official labor markets and have a habit of family responsibilities. When females do move into the labor force, they are regulated to unskilled and small-level office positions that replicate established gender biases (Forsythe, Korzeniewicz, & Durrant, 2000). Researchers also study how biased cultural traditions and legal institutions can bind females' ability to attain equal status. The scholar's findings for the GKC (Gender Kuznets curve) support some areas and stages of income.

Piketty (2006) explains Kuznets Curve Model (KCM) was first presented to determine the result of economic growth on the inequity in the distribution of income in the long run. The study's first hypothesis was that as a market force and an economy grow initiates to rise, and income inequity declines. Kuznets's study was created on information from a few periods in the United States (US) and the United Kingdom (UK). Investigation findings confirmed the first hypothesis of the research that income inequality and economic development follow a curve linear association and can be established by the inverted U form. The KCM (Kuznets Curve Model) was first used to draw the association between economic development and income inequality. Though, it is one of the famed models used to determine the kind of association that holds back economic development or growth and inequality. The purpose of this exploration is to observe whether the association between GDP per worker (economic development) and gender disparity in South Asian countries would follow a U-Shape or S-Shape Kuznets Curve. An S form KC (Kuznets Curve) means that the association between gender inequality and economic growth goes over three stages.

In the first stage, economic growth narrows the gender inequality gap (i.e., a positive relationship), then in the second stage, economic growth has a small or negative effect on the narrowing of the gender gap, and in the third stage, economic growth narrows the gender inequality gap. Contract infinitely or contract the positive effect of gender inequality. An inverse form KC (Kuznets Curve) also has three stages: first is a negative relationship between economic growth and gender inequality gap, second is a positive relationship between economic growth and gender inequality gap and in the third or final stage is economic growth and gender inequality. Negative association between inequality.

3. Data and Methodology

3.1. Research Model

The female-to-male ratio is denoted by the θ_F and the GDP per worker is denoted by the y. The econometrics form is as following:

$\theta_F = \alpha + \beta_1 (y_t) + \epsilon_t$

$\theta_F = \alpha + \beta_1 (y_t) + \beta_2 (y_t)^2 + \epsilon_t$

$\theta_F = \alpha + \beta_1 (y_t) + \beta_2 (y_t)^2 + \beta_3 (y_t)^3 + \epsilon_t$

In this equation, α is denoted by the coefficient the β is the intercept of the GDP per worker, the ϵ is denoted by the error term, and t is the time trend.

3.2. Data Sources and Variables

The present study was conducted in major South Asian countries. In this study, data on GDP per worker and female-to-male labor force contribution is collected from WDI, and the Global Gender Gap report 2019. In this study, the dependent variable is gender equality. Gender equality is measured by the female-to-male labor force contribution to total employment. The female labor force contribution is denoted by the θ_F. The independent variable is GDP per worker. The GDP per worker is denoted by y and the GDP per worker is measured by the GDP per capita PPP 2011 constant. The control variable is the GDP per worker in a square form and the GDP per worker in the cubic form.

3.3. Methodology

This study used the ARDL time series model to explore the relationship between GDP per worker and gender equality. The researcher uses the recently developed ARDL (Autoregressive Distributed Lag) bounds testing approach to test the long-run stability of the relationship between GDP per worker (economic growth) and gender equality (female participation in employment). A co-integration association can be concluded. Period from 1990 to 2019. The advantage of this method is that it enables long-term co-integration to be explored, regardless of whether the variables are level or prior. As the Gender Kuznets Curve (GKC) model consists of share and level variables, and then the Auto Regressive Distributed Lag method fits more suitable than some other co-integration procedures. The female part of the labor force contribution in total employment (15+age of female) and the female part of the labor force contribution in total employment (in the age range of 15-64) is the dependent variable. The independent variable is GDP per worker. In this study, we employ the three equations check to whether there is a cubic, quadratic, or linear association between shares of female labor power contribution and GDP per worker in the long run.

3.4. Research Model

In this study, we employed the three equations check to whether there was a cubic, quadratic, or linear association between shares of female labor power contribution and GDP (Gross domestic product) per worker in the long run.

$$(\theta_{F,t}) = \lambda_{l0} + \lambda_{l1} (y_t) + \epsilon_{lt} \quad (1)$$

The coefficients $\lambda_{lk,}$ where k= 1 are the long run elasticity estimates of woman to man part in employ $(\theta_{F,t})$. Using a simplified version of GDP per worker (y_t). Linear and temporal trend indexes, respectively, are indicated by the subscripts l and t and ϵ_t is the error term

$$\theta_{F,t} = \lambda_{q0} + \lambda_{q1} (y_t) + \lambda_{q2} ((y_t))^2 + \epsilon_{qt} \quad (2)$$

The coefficients $\lambda_{qi,}$ where are i = 1, 2 indicate estimates of the labor force contribution of women relative to males over the long run ($\theta_{F,}$), Wity_t nd the square of GDP per worker Subscripts q and t are denoted quadratic and time trend indexes respectively. ϵ_t is the error term.

$$(\theta_{F,\,t}) = \lambda_{c0} + \lambda_{c1}\,(y_t) + \lambda_{c2}\,(y_t))^{2} + \lambda_{c3}\,(y_t))^{3} + \epsilon_{ct} \quad (3)$$

The coefficients λ_{cj}, Where the estimates of the long-term elasticity of the proportion of women participating in the labor force ($\theta_{F,}$) are (j = 1, 2, 3). With GDP per worker (y_t), GDP per worker with square form GDP per worker in cubic form Subscripts c and t denotes to cubic and time trend index respectively$_t$ is the error term.

3.5. Unit Root Test

Time trend is contained within the maximum of the time series data. The main problem of the non-stationary is faced in time series data. In the long run co-integration association between the variables is essential when the data is stationary. So, the regression result was attained with the OLS technique and the OLS technique is reliable if the variable is co-integrated and stationery. The Ng Perron unit root test was employed to examine the issue of non-stationarity in time series data. Ng and Perron (2001) developed the Ng Perron unit root test.

3.6. ARDL Cointegration Analysis

The long-run cointegration test is to check the existing association between the variables. Firstly Engle and Granger (1987) were given the idea of cointegration. Pesaran, Shin, and Smith (2001) method and Johansen (1992) method are extensively used methods for co-integration. Bound testing method to cointegration is used in this study, Contained by an ARDL (Auto Regressive Distributed Lag) framework. The ARDL technique is developed by Pesaran, Shin, and Smith (1999) and Pesaran et al. (2001). Three stages comprise the ARDL method's application. To observe the quadratic and cubic nonlinear relationships between female labor force participation and economic growth over time, the following equations are used:

$$\Delta\theta_{F,\,t} = \alpha_{c1} + \Sigma^{p}_{i=1}\,\beta_{c1i}\,\Delta\,\theta_{F,\,t-i} + \Sigma^{r}_{j=0}\,\gamma_{c1j}\Delta y_{t-j} + \Sigma^{s}_{k=0}\,\varphi_{c1k}\,\Delta y^{2}_{t-k} + \Sigma^{z}_{l=0}\,\rho_{c1l}\,\Delta y^{3}_{t-l} + \zeta_{c1}\theta_{F,\,t-1} + \zeta c_2 y_{t-1} + \zeta c_3 y^{2}_{t-1} + \zeta c_4 y^{3}_{t-1} + \eta_{c1t} \quad (4a)$$

$$\Delta\theta F,\,t = \alpha q1 + \Sigma\,pi{=}1\;\beta q1i\;\Delta\;\theta F,\,t-i + \Sigma\;rj{=}0\;\gamma q1j\;\Delta yt-j + \Sigma\;sk{=}0\;\varphi q1k\;\Delta y2t-k + \zeta q1\theta F,\,t-1 + \zeta q2yt-1 + \zeta q3y2t-1 + \eta q1 \quad (4b)$$

Where $\eta c1t$ is represented by the error terms white noise for the cubic procedure of the model. The $\eta q1t$ is denoting the error terms white noise for quadratic procedures of the model. The First difference operator is denoted the Δ. The ARDL technique's parameters, and, as well as ζci, i=1, 2, 3, 4 and ζqj, j=1, 2, 3 are what is known as the short-run coefficients. The bounds analysis method is based on joint Wald statistics or F-statistics, albeit the variables of the lagged levels are taken into account through the null hypothesis of no co-integration, H0: ζc (1, 2, 3, 4) =0 co-integration, as opposed to the alternative of the presence, H1: ζc (1, 2, 3, 4) ≠0. If the cubic specification of the cointegration relative is not established, then for quadratic specification similar process is applied, for example, no cointegration in the null hypothesis, H0: ζq (1, 2, 3) =0 co-integration contrary to the alternate of the presence, H1: ζq (1, 2, 3) ≠0. Due to the absence of annual time series data available, this study uses F-statistics to determine the critical values of Narayan and Smyth (2005) on the employed population, GDP per worker, and employed female population for the major south Asia countries. When the critical values are increased than the computed F statistics, the

cointegration test is uncertain. As soon as the cointegration between the variables is established, is to use the ARDL approach and the ECM (Error Correction Model) for the connected ARDL to measure the long-run coefficients after processing the short-run coefficients (Equations 6a, 6b) and the long-run coefficients (Equations 5a, 5b).

$$\theta_{F,t} = \alpha_{c2} + \Sigma^{p}_{i=1}\ \beta_{c2i}\ \theta_{F,t-i} + \Sigma^{\gamma}_{j=0}\ r_{c2j}\ y_{t-j} + \Sigma\ ^{s}_{k=0}\ \varphi_{c2k}\ y^{2}_{t-k2} + \Sigma\ ^{z}_{l=0}\ \rho_{c2l} y^{3}_{t-l} + \eta_{c2t} \quad (5a)$$

$$\theta_{F,t} = \alpha_{q2} + \Sigma^{p}_{i=1}\ \beta_{q2i}\ \theta_{F,t-i} + \Sigma^{\gamma}_{j=0}\ r_{q2j}\ y_{t-j} + \Sigma\ ^{s}_{k=0}\ \varphi_{q2k}\ y^{2}_{t-k2} + \eta_{q2t} \quad (5b)$$

$$\theta F,\ t = \alpha c3 + \Sigma pi=1\ \beta c3i\ \Delta\ \theta F,\ t-i + \Sigma\ r\ j=0\ \gamma c3j\ \Delta yt-j + \Sigma\ sk=0\ \varphi c3k\ \Delta y2t-k + \Sigma\ zl=0\ \rho c3l\ \Delta y3t-l + \mu\ ECTt-1 + \eta c3t \quad (6a)$$

$$\theta_{F,t} = \alpha_{q3} + \Sigma^{p}_{i=1}\ \beta_{q3i}\ \Delta\theta_{F,t-i} + \Sigma^{r}_{j=0}\ \gamma_{q3j}\Delta y_{t-j} + \Sigma\ ^{s}_{k=0}\ \varphi_{q3k}\ \Delta y^{2}_{t-k} + \mu\ ECT_{t-1} + \eta_{q3t} \quad (6b)$$

Error Correction term (ECT) coefficient is the μ and it must be statistically negative and significant. The variable of the speed of convergence concludes through Error Correction term of to the equilibrium. For quadratic and cubic specifications, the Error Correction term is defined as follows:

$$ECT_t = \theta_{F,t} - \Sigma\ ^{p}_{i=1}\ \beta_{c2i}\ \theta_{F,t-i} - \Sigma^{r}_{j=0}\ \gamma_{c2j} y_{t-j} - \Sigma\ ^{s}_{k=0}\ \varphi_{c2k}\ y^{2}_{t-k} - \Sigma\ ^{z}_{l=0}\ \rho_{c2l}\ y^{3}_{t-l}$$

$$ECT_t = \theta_{F,t} - \Sigma\ ^{p}_{i=1}\ \beta_{q2i}\ \theta F,_{t-i} - \Sigma\ ^{r}_{j=0}\ \gamma_{q2j}\ y_{t-j} - \Sigma\ ^{s}_{k=0}\ \varphi_{q2k} y^{2}_{t-k}$$

The short-run and long-run coefficients exist in Tables 9, 10, 11, 12, and tables 13,14,15,16

4. Results and Discussion

In this section, we find the results and discuss it.

Table 1
Descriptive Statistics

	Pakistan		India		Bangladesh		Sri Lanka	
	Θ_F	Y	Θ_F	Y	Θ_F	Y	Θ_F	Y
Mean	0.22	3885.63	0.35	3589.14	0.33	2280.27	0.49	6894.64
Median	0.21	3748.26	0.36	3189.27	0.32	1981.65	0.49	6077.48
Max.	0.29	5190.07	0.39	6828.60	0.45	4057.25	0.58	11610.91
Min.	0.15	3195.47	0.29	1859.04	0.27	1358.18	0.44	3587.41
SD	0.05	621.26	0.03	1477.12	0.05	814.06	0.02	2610.81

Note SD, Min., and Max., represented standard deviation, minimum, and maximum respectively. The observation period includes 1990 to 2018.

Table 2
Ng-Perron Unit Root Test

Unit root test result for Pakistan				
At Level				
Variable	**Ng-Perron Test Statistics**			
	MZa	**MZt**	**MSB**	**MPT**
θ_F	0.37262	0.25479	0.68379	32.0243
Y	-1.00595	-0.35307	0.35098	11.1197
Y^2	-4.69931	-1.15409	0.24559	5.88278
Y^3	-28.7819	-3.54272	0.12309	1.60659
At First Difference				
Variable	**Ng-Perron Test Statistics**			
	MZa	MZt	MSB	MPT
θ_F	-13.19**	-2.56806	0.19469	1.85768
Y	-10.01**	-2.13845	0.21344	2.82048
Y^2	-52.32***	-5.10382	0.09754	1.79447
Y^3	-57.54***	-5.33230	0.09266	1.73032

Note: *, **, and *** represent that we may reject the null hypothesis of unit root at 10%, 5%, and 1% level of significance respectively.

To check the stationary, we used the Ng-Perron unit root test of time series data. The Ng-Perron unit root test was applied using the SIC (Schwarz Information Criterion) for maximum lag selection. The result of the unit root Ng perron test has been described in Tables 2, 3, 4, and 5.

Table 2 is a test of unit root for Pakistan; no variables are significant at the level. Women to men labor force contribution and GDP per worker is stationary at 1st difference at 5% significance of level. Similarly, GDP per worker square and the cubic form is stationary at 1st difference at 1% of the significance level.

Table 3
Ng-Perron Unit Root Test

Unit root test result for India				
	At Level			
Variable	Ng-Perron Test Statistics			
	MZa	MZt	MSB	MPT
θ_F	-10.4424**	-2.17660	0.20844	2.75490
Y	-1644.23***	-28.6459	0.01742	0.08141
Y^2	-76.9062***	-6.05072	0.07868	1.79873
Y^3	2.60890	1.27141	0.48734	74.6325
	At first Difference			
Variable	Statistics for the Ng-Perron Test			
	MZa	MZt	MSB	MPT
θ_F	-20.7796***	-3.222	0.15509	1.18114
Y	-14.6069*	-2.687	0.18401	6.32204
Y^2	-240.307***	-10.923	0.04546	0.47220
Y^3	-66.5846***	-5.6423	0.08474	1.92029

Note: At 10%, 5%, and 1% levels of significance, respectively, *, **, and *** indicate that we may reject the unit root null hypothesis.

Table 3 is the unit root test for India. Woman-to-man labor force contribution is stationary at a 5% level of significance at the level and at a level of importance of 1%, the GDP per worker and its square are stagnant. While the GDP per worker cubic form is stationary at a 1% level of significance.

Table 4
Ng-Perron Unit Root Test

Unit root test result for Bangladesh				
	At Level			
Variable	Ng-Perron Test Statistics			
	MZa	MZt	MSB	MPT
θ_F	-89.023***	-6.57872	0.07390	1.38276
Y	-12.3291	-2.25966	0.18328	8.52585
Y^2	0.81374	0.34378	0.42247	50.5945
Y^3	3.17411	1.84497	0.58126	105.602
	At 1st Difference			
Variable	Ng-Perron Test Statistics			
	MZa	MZt	MSB	MPT
θ_F	-16.8381*	-2.740	0.16274	6.33818
Y	-85065.2***	-206.23	0.00242	0.00186
Y^2	-210.853***	-10.05	0.04767	0.99894
Y^3	-182.213***	-9.425	0.05173	0.83633

Note: At 10%, 5%, and 1% levels of significance, respectively, *, **, and *** indicate that we may reject the unit root null hypothesis.

Table 4 is a test of unit root for Bangladesh. The GDP per worker, GDP per worker square, and GDP per worker cubic form are stable at the first difference at a 1% significance of

level, and the only variable of the female to male labor force participation is stationary at the level of a 1% significance of level.

Table 5
Ng-Perron Unit Root Test

Unit root test result for Sri Lanka				
At Level				
Variable	**Ng-Perron Test Statistics**			
	MZa	**MZt**	**MSB**	**MPT**
θ_F	-3.01101	-1.08007	0.35870	26.6021
Y	-699.00***	-18.6643	0.02670	0.05710
Y^2	-35.439***	-4.14738	0.11703	2.90587
Y^3	-9.28011*	-1.84614	0.19893	3.73344
At 1st Difference				
Variable	**Ng-Perron Test Statistics**			
	MZa	MZt	MSB	MPT
θ_F	-12.8802**	-2.52135	0.19575	1.96455
Y	-9.31516**	-2.15813	0.23168	2.63017
Y^2	-6.49567*	-1.78305	0.27450	3.83461
Y^3	-514.387*	-16.0315	0.03117	0.18697

Note: at 10%, 5% and 1% levels of significance represent *, **, and *** that we may reject the null hypothesis of unit root respectively.

Table 5 is the unit root for Sri Lanka. The only variable that is steady at the first difference at a 5% significance level is the gender gap in labor force participation. Additionally, the GDP per worker, GDP per worker square, and GDP per worker cubic form are level and stationery at 1%, 1%, and 5%, respectively. This result shows that the unit root test for all variables fails when the first difference between the variables is used. Thus, have mix order of integration of the variables.

Table 6
The Linear Specification Bounds F-test for the Estimated ARDL for Cointegration

Linear Specification			
Country	Period	Mode	F Statics
Bangladesh	1990-2018	1,1	8.756804***
India	1990-2018	4,3	6.040077**
Sri Lanka	1990-2018	1,1	12.91469***
	Critical Value	1(0)	1(1)

Note: From the ARDL cointegration test F-statistics are acquired. The critical values for upper I (1) and the lower I (0) are due to Narayan (2005): Table 6 for k=1 for linear association and n=30. At 1%, 5%, and 10%, are represented superscripts *******, ******, ***** in bold significance levels respectively. Do not work in the linear specification of the bounds F-test for cointegration for Pakistan due to the data problems.

Table 7
The Quadratic Specification Bounds F-test for the Estimated ARDL for Cointegration

Quadratic Specification			
Country	Period	Mode	F Statics
Bangladesh	1980-2018	1,1,1	9.082068***
Pakistan	1980-2018	1,1,0	4.705794*
Sri Lanka	1980-2018	1,0,1	10.49056***
India	1980-2018	1,0,1	4.065093*

Note: From the ARDL cointegration test F-statistics are acquired. The critical values for upper I (1) and the lower I (0) are due to Narayan and Smyth (2005): Table 7 for k=2 for quadratic association and n=30. At 1%, 5%, and 10%, are represented superscripts *******, ******, ***** in bold significance levels respectively.

The upper bound value is 6.76 and the F statistics is 8.756804, the F statistics values which are greater than at 1% significance level for Bangladesh. For India, the upper bound

value is 4.663 and the F statistics is 6.040077, the F statistics values which are greater than at a 5% significant level. The upper value is 6.76 and the F statistics is 12.91469, the F statistics values which are greater than at 1% level for Sri Lanka.

The upper bound value is 6.265 and the F statistics is 9.082068, the F statistics value which is greater than at 1% level of significance for Bangladesh. For India, the upper bound value is 3.695 and the F statistics is 4.065093, the F statistics value which is greater than the 10% level of significance. The upper value is 6.265 and the F statistics is 10.49056, the F statistics value which is greater than at 1% level for Sri Lanka. The upper bound value is 3.695and the F statistics is 4.705794, the F statistics value which is greater than at 10% level for Pakistan.

Table 8
The Cubic Specification Bounds F-test for the Estimated ARDL for Cointegration

Cubic Specification			
Country	Period	Mode	F Statics
Bangladesh	1980-2018	1,2,1,2	7.387512***
Pakistan	1980-2018	2,4,4,4	8.618520***
Sri Lanka	1980-2018	4,4,4,4	30.31225***
India	1980-2018	1,0,0,1	5.580271**

Note: From the ARDL cointegration test F-statistics are acquired. The critical values for upper I (1) and the lower I (0) are due to Narayan and Smyth (2005): Table 8 for k=3 for cubic association and n=30. At 1%, 5%, and 10%, are represented superscripts ***, **, * in bold significance levels respectively.

The upper bound value is 5.966 and the F statistics is 7.387512, the F statistics value which is greater than at 1% significance level for Bangladesh. For India, the upper bound value is 4.306 and the F statistics is 5.58027, the F statistics value which is greater than significant levels. The upper value is 5.966 and the F statistics is 30.31225, the F statistics value which is greater than at 1% level for Sri Lanka. The upper value is 5.966 and the F statistics is 8.618520, the F statistics value which is greater than at 1% level for Pakistan. The long-run coefficient exists in Tables 9, 10, 11, and 12.

Table 9
Long Run Estimate for Sri Lanka

Long Run Estimate for Sri Lanka			
	Dependent Variable $=\theta_F$		
Variable	Coefficient	T-Statistics	P-value
Y	0.000567	-2.585395	0.0491
Y2	-6.66E-08	2.084945	0.0915
Y3	2.71E-12	-1.731118	0.1440
C	3.578030	-	0.0012

The findings presented in Table 9 demonstrate that y which is GDP per worker and y^3 are significant and negative impacts on gender equality (woman's labor force contribution) in the long run. But the y2 is a positive and significant impact on gender equality. The results show that the S formed in Sri Lanka.

Table 10
Long Run Estimate for Pakistan

Long Run Estimate for Pakistan			
	Dependent Variable $=\theta_F$		
Variable	Coefficient	T-Statistic	P-value
Y	0.008840	2.215920	0.0623
Y2	-2.34E-06	-1.987273	0.0872
Y3	2.07E-10	1.806494	0.1138
C	-11.00268	-	0.0448

The findings reported in above table display that y which is GDP per worker and y^3 are positive and do not significant effect on gender equality (woman's labor force contribution) in the long run. But the y2 is positive and does not significantly impact gender equality. The result shows that Pakistan has the S-shaped gender Kuznets curve.

Table 11
Long Run Estimate for Bangladesh

Long Run Estimate for Bangladesh			
	Dependent Variable =Θ_F		
Variable	Coefficient	T-Statistic	P-value
Y	0.000554	5.135720	0.0001
Y2	-2.18E-07	-3.937256	0.0011
Y3	3.11E-11	3.537660	0.0025
C	-0.140146	-	0.0382

The findings reported in above table display that y which is GDP per worker and y^3 is a positive and significant impact on gender equality (woman's labor force contribution) in the long run. But the y2 is a negative and significant impact on gender equality. The result shows that Bangladesh has the S-shaped Kuznets curve.

Table 12
Long Run Estimate for India

Long Run Estimate for India			
	Dependent Variable =Θ_F		
Variable	Coefficient	T-Statistic	P-value
Y	0.000277	3.768663	0.0011
Y2	-7.90E-08	-4.295840	0.0003
Y3	5.53E-12	3.824920	0.0009
C	0.088708	-	0.3456

The findings reported in above table display that y which is GDP per worker and y^3 are positive and significant impacts on gender equality (woman's force contribution) in the long run. But the y2 is a negative and significant impact he genders equality. The result shows that India has the Z-shaped gender Kuznets curve. The short-run coefficients exist in Tables 13, 14, 15, and 16.

Table 13
Short Run Estimate for Sri Lanka

Short Run Estimate for Sri Lanka			
	Dependent Variable =Θ_F		
Variable	Coefficient	t-Statistic	p-Value
D(Θ_F (-1))	0.146671	2.143551	0.0849
D(Θ_F (-2))	-0.011513	-0.217192	0.8366
D(Θ_F (-3))	-0.820276	-13.46587	0.0000
D(Y)	-0.001721	-3.437130	0.0185
D(Y(-1))	-0.003271	-5.464833	0.0028
D(Y(-2))	-0.002721	-3.784858	0.0128
D(Y(-3))	0.002417	4.650031	0.0056
D(Y2)	3.33E-07	4.678982	0.0054
D(Y2(-1))	3.30E-07	3.791871	0.0127
D(Y2(-2))	3.79E-07	3.685932	0.0142
D(Y2(-3))	-4.37E-07	-5.606868	0.0025
D(Y3)	-1.64E-11	-5.193203	0.0035
D(Y3(-1))	-9.76E-12	-2.492667	0.0550
D(Y3(-2))	-1.54E-11	-3.415339	0.0189
D(Y3(-3))	2.34E-11	6.410161	0.0014
CointEq(-1)*	-1.651682	-16.51697	0.0000

The statistically significant error correction term has a negative sign. This one is also proof that tables have long-run relationships. In Table 13, the reported results show that theoretically expected signs coefficients of all GDP per worker components are statistically significant. Our short-run analysis Lags off GDP per worker, and y^2 and y^3 variables are used. The results demonstrate the negative coefficient and significance of the GDP per worker lag. It follows that GDP per worker has an impact on gender equality with a one-year lag.

Table 14
Short Run Estimate for Pakistan

Short Run Estimate for Pakistan			
	Dependent Variable $=\Theta_F$		
Variable	Coefficient	t-Statistic	p-Value
$D(\Theta_F(-1))$	0.511479	5.219364	0.0012
D(Y)	-0.005336	-3.465933	0.0105
D(Y(-1))	0.001174	0.659713	0.5305
D(Y(-2))	0.001718	0.693353	0.5104
D(Y(-3))	-0.026323	-8.694202	0.0001
D(Y2)	1.39E-06	3.447811	0.0107
D(Y2(-1))	-3.44E-07	-0.736575	0.4853
D(Y2(-2))	-3.46E-07	-0.514254	0.6229
D(Y2(-3))	7.07E-06	8.525731	0.0001
D(Y3)	-1.16E-10	-3.335117	0.0125
D(Y3(-1))	2.96E-11	0.733244	0.4872
D(Y3(-2))	1.68E-11	0.278144	0.7889
D(Y3(-3))	-6.28E-10	-8.370985	0.0001
Co-intEq(-1)*	-0.673166	-8.229031	0.0001

Table 15
Short Run Estimate for Bangladesh

Short Run Estimate for Bangladesh			
	Dependent Variable $=\Theta_F$		
Variable	Coefficient	t-Statistic	p-Value
D(Y)	-0.000850	-4.740603	0.0002
D(Y(-1))	-0.000158	-3.887531	0.0012
D(Y2)	3.41E-07	5.469962	0.0000
D(Y3)	-4.42E-11	-6.354307	0.0000
D(Y3(-1))	5.92E-12	3.938724	0.0011
Co-intEq(-1)*	-0.681374	-6.754906	0.0000

The statistically significant error correction term has a negative sign. This one is also proof that the variables have long-run relationships. In Table 14, the reported results show that theoretically expected signs coefficients of all GDP per worker components and in the short run are statistically significant. Our short-run analysis Lags off GDP per worker, and y^2 and y^3 variables are used. The results demonstrate the negative coefficient and significance of the GDP per worker lag. It follows that GDP per worker has an impact on gender equality with a one-year lag.

The statistically significant error correction term has a negative sign. This one is also proof that the variables have long-run relationships. In Table 15, the reported findings display that have theoretically expected signs coefficients of all GDP per worker components and in the short run are statistically significant. Our short-run analysis Lags of GDP per worker, and y^2 and y^3 variables are used in. The results demonstrate the negative coefficient and significance of the GDP per worker lag. It follows that GDP per worker has an impact on gender equality with a one-year lag.

Table 16
Short Run Estimate for India

Short Run Estimate for India			
Dependent Variable $=\Theta_F$			
Variable	Coefficient	t-Statistic	p-Value
D(Y3)	3.09E-12	5.592776	0.0000
Co-int Eq(-1)*	-0.289304	-5.742328	0.0000

The statistically significant error correction term has a negative sign. This one is also proof that the variables have long-run relationships. In table 16, the reported results show that have theoretically expected signs coefficients of all GDP per worker components and in the short run are statistically significant. Our short-run analysis Lags of GDP per worker, and y^2 and y^3 variables are used in. The results demonstrate the negative coefficient and significance of the GDP per worker lag.

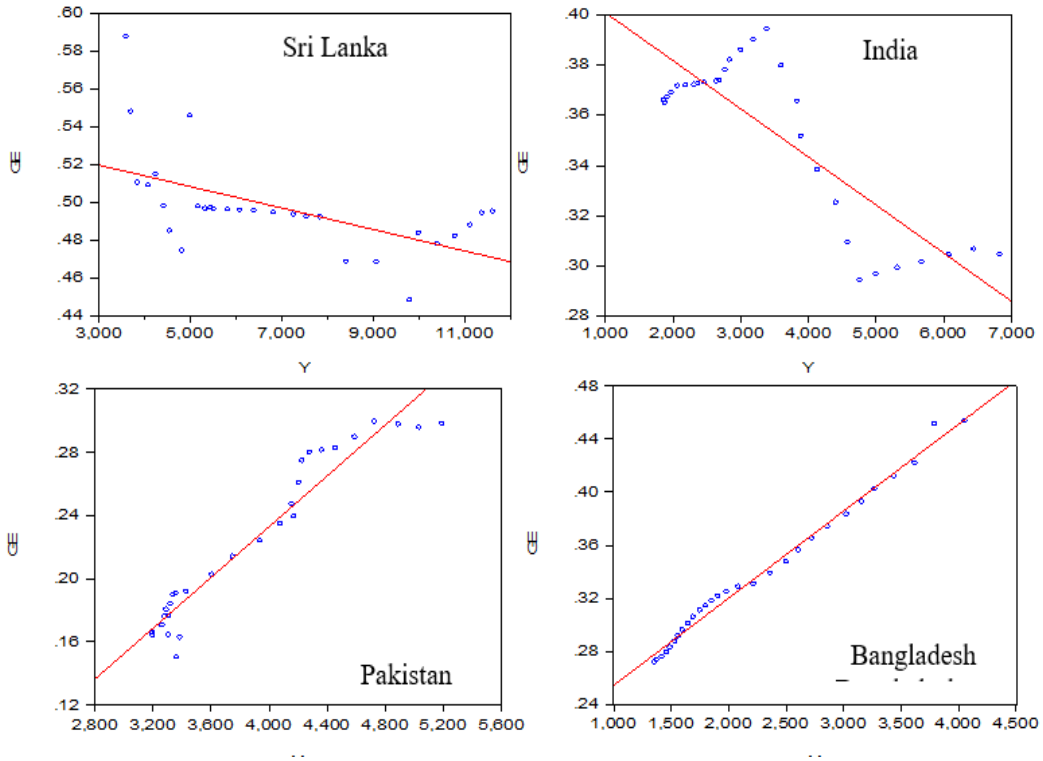

Figure 1: shows the GDP per worker and the proportion of women workers
Note: GE is denoted by gender equality (share of female workers) and y is denoted by the GDP per worker.

Figure 1 shows that Sri Lanka has an S-shaped GKC (Gender Kuznets Curve); India has Z shaped GKC (Gender Kuznets Curve); Pakistan has an S shape, and Bangladesh has an S-shaped GKC (Gender Kuznets Curve) association in the corresponding periods of countries considered.

4.1. Stability of Short-run and Long-run Coefficients

The stability of the short-run and long-run coefficients are checked over and done with the CUSUMSQ (cumulative sum squares) and CUSUM (cumulative sum) assessments cause to (Brown, Durbin, & Evans, 1975).

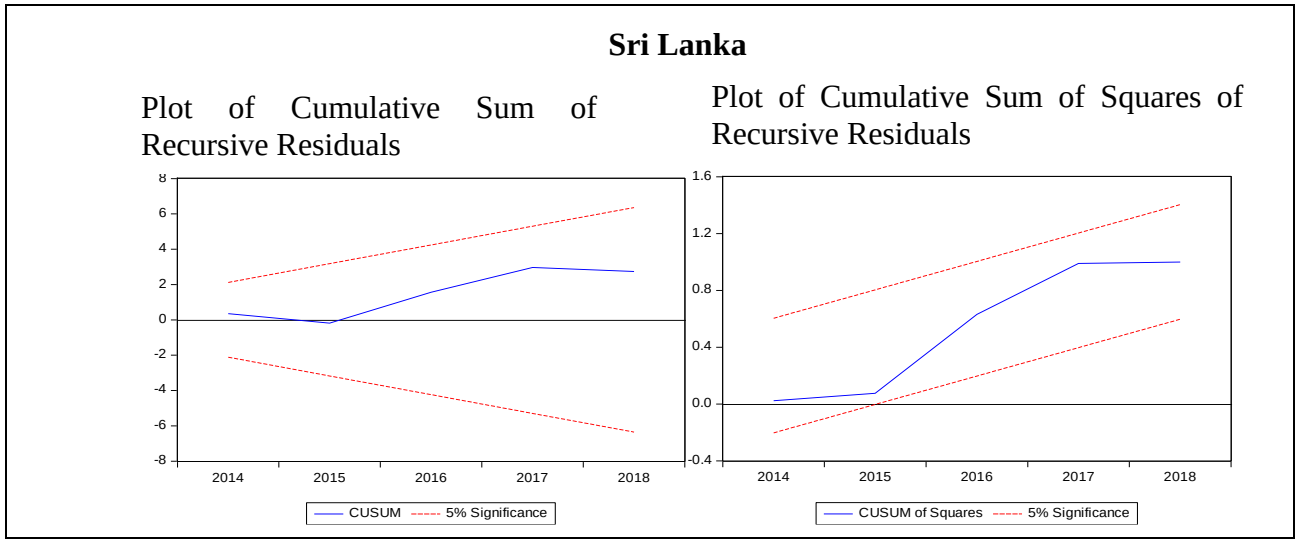

Figure 1: Plot of the Tests for Sri Lanka's Parameter Stability Using the Cumulative Sum and Cumulative Sum Squares

In the plot of cumulative sum squares and cumulative sum test statistics 5% significant level fall inside the critical bounds present in figure 2. This suggests that the stability over the period are estimated factor.

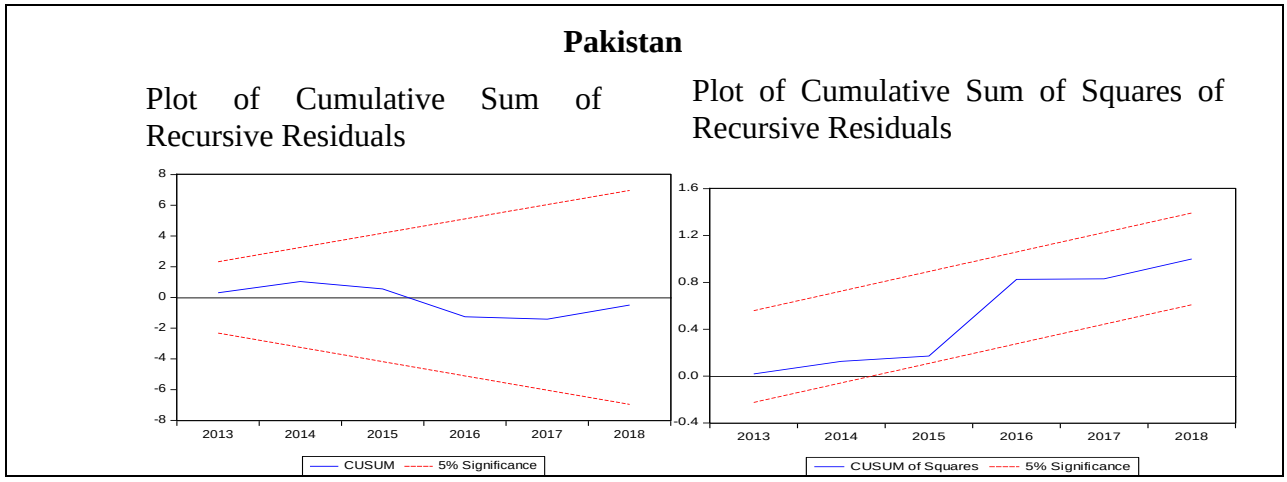

Figure 2: For the Parameter Stability of Pakistan, A Plot of the Cumulative Sum and Cumulative Sum Squares Tests.

In the plot of cumulative sum squares and cumulative sum test statistics 5% significant level of fall inside the critical bounds present in figure 3. This suggests that the stability over the period is estimated factor.

In the plot of cumulative sum squares and cumulative sum test statistics 5% significant level fall inside the critical bounds present in figure 4. This suggests that the stability over the period are estimated factor.

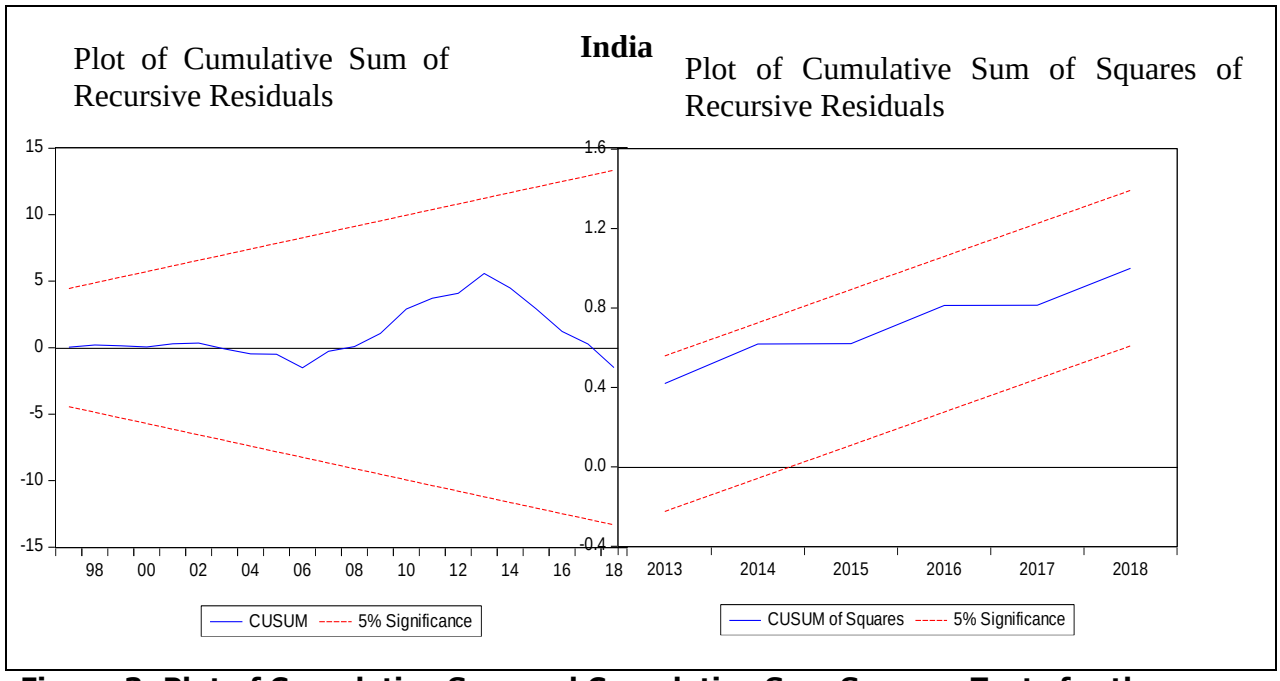

Figure 3: Plot of Cumulative Sum and Cumulative Sum Squares Tests for the Parameter Stability of India.

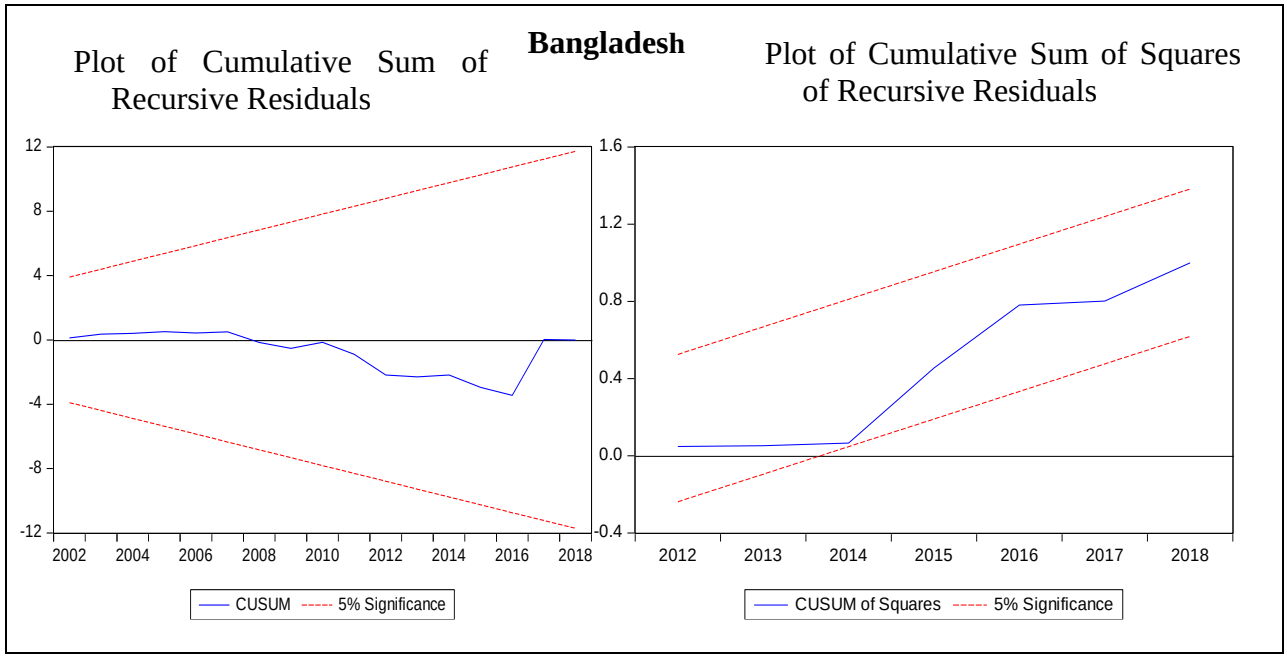

Figure 4 Plot of Cumulative Sum and Cumulative Sum Squares Tests for the Parameter Stability of India.

In the plot of cumulative sum squares and cumulative sum test statistics 5% significant level of decrease inside the critical bounds present in figure 5. This suggests that the stability over the period is estimated factor.

5. Conclusion

Due to the restricted annual time series data, this analysis uses the Narayan and Smyth (2005) critical values for the employed population, GDP per worker, and employed female

population for the major South Asian nations as the boundaries for the F-statistics. This is run for both quadratic specifications and cubic specifications in Sri Lanka, Pakistan, Bangladesh, and India. The following is supported by the results of the ARDL bound testing co-integration method: Sri Lanka has an S-shaped GKC (Gender Kuznets Curve); India has Z shaped GKC (Gender Kuznets Curve); Pakistan has an S shape, and Bangladesh has an S-shaped GKC (Gender Kuznets Curve) association in the corresponding stages of countries measured. In conclusion, we examine together quadratic and cubic arrangements of the Gender Kuznets Curve and bring into being that the Gender Kuznets Curve is S-shaped (+, -, +) for Sri Lanka, S-shaped for Pakistan, S-shaped for Bangladesh, and Z shaped (+, -, +) for India. These conclusions have the following essential for policy makers' suggestions. Economic growth did not directly involve gender equality, whether the quadratic or cubic relationship among them, any country involvement stages of decrease in gender equivalence of women employ to be subsidized. Additional point is, and maybe more thoughtful economic growth may in the end findings in lower stages of gender equivalence. For example, the inverted U formed Gender Kuznets's Curve (GKC) suggests that gender equivalence decrease as increases GDP per worker. From this time, if a Gender Kuznets Curve curvilinear is the true description gender equivalence needs to be subsidized in stages when it is decreasing.

Some important problems appear for future exploration. The first important point of this research has presented the association between gender equality and GDP per worker (economic development). In gender equality, we measure female-to-male labor force participation. We hope that our results will stimulate researchers to examine how future developments in education, society, and politics may be influenced by economic development. Secondly, researchers should discover whether or not the same sources of development have to change values for gender equivalence. For instance, does economic progress based on human capital progress have the same values for gender equivalency as economic progress based primarily on the exploitation of natural resources? This might have important values for the inspiration of gender equivalence in social, economic, and political organizations. Perhaps, some developing paths make stronger male-controlled organizations and disappoint females beginning to put in human capital, finally declining gender equality. Therefore, before embracing the idea that "economic development and globalization is the solution for all ills," proponents of the free market must carefully weigh the benefits of various development processes for social issues in general and for equivalence in particular.

Authors' Contribution

Sobia Liaqat: Conceptualization, Data curation, Supervision, Writing- Original draft preparation.
Yasir Bashir: Methodology, Results, and Discussion.
Amber Khalil: Visualization, Investigation, Software.
Wajid Khan: Writing- Reviewing and Editing and Study design.

Conflict of Interests/Disclosures

The authors declared no potential conflict of interest w.r.t the research, authorship and/or publication of this article.

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