

## **AGRICULTURE-LED GROWTH IN SOUTH ASIAN COUNTRIES AND THE EFFECTS OF MACROECONOMIC VARIABLES ON ECONOMIC DEVELOPMENT**

Patalee B.<sup>1</sup> and Jeong H.<sup>2</sup>

*University of Kentucky*

[pataleema@uky.edu](mailto:pataleema@uky.edu)<sup>1</sup>

### **Abstract**

*This paper takes an empirical perspective and focuses on the role of agriculture and macroeconomic variables on economic development in South Asian countries. Agriculture is one of the key sectors in the region hence agriculture historically had a significant impact on economic development. To obtain empirical evidence, this study analyzes the long-run relationship between key time-series variables. In addition, co-integration and error correction models are employed for each country utilizing annual agricultural and economic data collected from FAO and World Bank statistics for the period 1990-2020. Even though there is some skepticism about agriculture's contribution to economic growth, the results provide evidence of a long-run relationship between economic growth and agricultural production in the majority of South Asian economies. Hence, the results have important agricultural and economic policy implications.*

**Key words:** Agricultural Production, Economic Growth, South Asia, Cointegration

### **Introduction**

Agriculture is central to South Asian economies. Intensive agricultural economies are outflows of the green revolution in South Asia (Atapattu and Kodituwakku, 2009). In countries where agricultural employment is a significant share of the labour force, the development of the agricultural sector is essential for economic growth (Oyakhilomen and Zibah, 2014). In many Asian countries, agriculture-led growth has played an important role in reducing poverty and transforming economies (Diao et al., 2010). The development of agriculture resulted in an increase in food supplies (Johnston and Mellor, 1961). Problems that developing countries have experienced such as high rates of population growth, climate, and economic challenges have not been favourable to the agricultural sector. Price policy, infrastructure development, urbanization, and technological development have greatly influenced agricultural diversification in the region (Joshi et al., 2004). The growth in the agricultural sector facilitates an increase in food supplies, reducing poverty and transforming primary industries into secondary and service industries.

The South Asian countries share a similar economic structure (i.e., a prominent public sector, and a nationalized financial sector) (Mallik and Chowdhury, 2001). Agricultural production plays a pivotal role in the economic development of these countries (Awokuse and Xie, 2015). Much of South Asian countries have seen economic growth in recent years. Between 2010 and 2018, the South Asian economy grew at an average of 6.7 percent. Most of this growth has been driven by India (World 101). The current study attempts to bridge the gap in the empirical literature on the impact between agricultural production and economic growth in South Asian countries.

A sound understanding of the relationship between economic growth and agricultural production in the South Asian region would help create appropriate economic and agricultural policies which could benefit regional economic growth. In addition, the research could help policymakers to have a better understanding of the role of investments in agriculture resulting in better resource allocation (Awokuse and Xie, 2015). The objective of the current study is to empirically examine the long-run and short-run relations between economic growth and agricultural production in the South Asian region by employing the autoregressive distributed lag (ARDL) bounds testing approach. To assess agriculture as a cause of economic growth, time-series data for countries in South Asia (i.e., Sri Lanka, Bangladesh, Bhutan, India, Maldives, Nepal, and Pakistan) were used.

## Literature Review

The impact of agriculture on economic growth in developing countries has been a question of interest among economists. Although several studies have outlined the theoretical relationship between agriculture and economic growth, the causal impact is an important aspect worthy of further investigation. An early study by Johnston and Mellor (1961) studies the role of agriculture in economic development through intersectoral linkages. Awokuse and Xie (2015) observe the role of agriculture in promoting economic growth in nine developing countries; Asia (China, Indonesia, and Thailand); Latin America (Brazil, Chile, and Mexico); and Sub-Saharan Africa (Cameroon, Kenya, and South Africa). The results suggest that agriculture could be an engine of economic growth. However, the impacts vary across countries supporting the argument of the agriculture-led growth hypothesis.

Recent studies have shown mixed results on the effect of agriculture on economic growth. Some researchers have argued that agricultural development is a precondition to industrialization and economic growth. Schultz (1964) and Gollin et al. (2002) supported the fact that economic growth depends on the development of the agricultural sector. The study by Gollin et al. (2002), further argues that the growth in agricultural productivity is central to economic development and it can substantially delay industrialization. Oyinbo and Rekwot (2014) revealed that the causal relationship between economic growth and agriculture is modernizing the economic system in Nigeria. In some countries, an agricultural sector is the dominant contributor to the development of the economy because agriculture is a main resource of lives of people (Dube et al., 2019). In addition, poor agricultural technologies can impede economic growth hence, improvements in agricultural productivity can affect income positively.

In contrast to agricultural development and economic growth, Diao et al. (2010) found that, unlike Asian countries, there is little evidence to suggest economic transformation and agricultural development in African countries. Gardner (2005) confirms this finding by using a cross-sectional panel of 52 developing countries. Ashley and Maxwell (2001) argue that rural populations should focus on income diversification away from agriculture, although income diversification may not be a positive strategy if diversification is driven by stagnant agricultural growth (Haggblade et al., 2002). However, using Granger-causality tests, Tiffin and Irz (2006) found strong evidence of causality between agricultural value added and general economic growth. The finding is consistent with the agricultural productivity paradigm and economic growth.

Chebbi (2010) used Johansen's multivariate approach to study the cointegration of different sectors of the Tunisian economy by paying special attention to the non-causal relationship between agriculture and economic growth. The study results suggest that Tunisian economic sectors cointegrate and agriculture seems to have a partial role as a driving force in the growth of other sectors. A comprehensive study by Tsakok and Gardner (2007), discussed methodological issues in the assessment of the relationship between agriculture and economic growth. They also discussed two polar views regarding agriculture's role in economic growth; agricultural development is necessary for economic growth vs bypassing agricultural development and investing in building an industrial base instead.

The current study assesses the role of agricultural production in the process of economic growth in South Asian countries where agriculture is central to the economy. This paper focuses on finding evidence of the existence of the long-run relationship between agricultural production and economic growth rate. To estimate the long-run relationship, the cointegration test and vector error correlation model are applied to this study, controlling for important macroeconomic variables such as inflation, exchange rate, foreign direct investment (net inflows), and growth rate of broad money (M3). Through the time series analysis, this research examines whether the development of agriculture should be an effective macroeconomic policy in South Asian countries. To our knowledge, this is the first attempt to investigate the role of agriculture in economic development in the South Asian economies after significant economic turmoil in the region.

## Data

Data from South Asian countries (i.e., Sri Lanka, Bangladesh, Bhutan, India, Maldives, Nepal, and Pakistan) are used to assess the impact of agricultural production on economic growth. The study employs time series data on agricultural production, economic growth rate, exchange rate, inflation, foreign direct investments, and broad money growth over the period of 1990 to 2020. A data source for agricultural production is the Food and Agriculture Organization statistics (FAO STAT). Economic Growth, Exchange Rate, Inflation Rate, Foreign Direct Investment (Net inflow, % of GDP), and Broad Money Growth are from World Bank Open Data. Table 1 represents the summary statistics of the variables used in this study.

**Table 1: Summary statistics**

Country	Variables	Mean	Standard Dev.	Min.	Max.
Sri Lanka	Economic growth (%)	7.90	7.09	-4.52	25.85
	Agricultural production (1000 US\$)	3,925,600.00	772,128.90	3,035,596.00	5,999,018.00
	Exchange rate	102.88	44.20	40.06	198.76
	Inflation rate	8.89	4.95	2.14	22.56
	Foreign Direct Investment net inflows (% of GDP)	1.19	0.50	0.43	2.85
	Broad Money Growth (annual %)	17.69	7.92	8.32	49.98
Bangladesh	Economic growth (%)	8.53	5.24	-0.08	21.42
	Agricultural production (1000 US\$)	15,800,000.00	5,021,078.00	9,450,046.00	24,200,000.00
	Exchange rate	62.23	16.911	34.57	85.08
	Inflation rate	6.010	2.21	2.01	11.40
	Foreign Direct Investment net inflows (% of GDP)	0.61	0.51	0.01	1.74
	Broad Money Growth (annual %)	15.62	5.96	9.74	43.00
Bhutan	Economic growth (%)	8.02	9.29	-14.79	33.52
	Agricultural production (1000 US\$)	370,660.70	39,666.03	283,036.00	443,445.00
	Exchange rate	47.52	14.87	17.50	74.10
	Inflation rate	6.77	3.26	2.46	15.98
	Foreign Direct Investment net inflows (% of GDP)	0.97	1.50	-0.68	6.32
	Broad Money Growth (annual %)	18.78	12.54	3.75	58.94
India	Economic growth (%)	7.57	8.45	-11.53	26.95
	Agricultural production (1000 US\$)	255,000,000.00	70,400,000.00	164,000,000.00	388,000,000.00
	Exchange rate	47.52	14.87	17.50	74.10
	Inflation rate	7.20	3.14	3.33	13.87
	Foreign Direct Investment net inflows (% of GDP)	1.26	0.85	0.03	3.63
	Broad Money Growth (annual %)	15.36	3.83	6.80	22.27
Maldives	Economic growth (%)	9.77	10.93	-33.26	35.40
	Agricultural production (1000 US\$)	17,368.00	10,508.71	3,305.00	48,391.00
	Exchange rate	13.10	1.80	9.55	15.39
	Inflation rate	4.55	5.58	-1.69	20.13
	Foreign Direct Investment net inflows (% of GDP)	6.12	4.18	1.81	17.13
	Broad Money Growth (annual %)	16.00	8.72	-0.18	35.90
Nepal	Economic growth (%)	7.78	8.16	-8.24	29.52
	Agricultural production (1000 US\$)	6,040,716.00	1,833,526.00	3,631,993.00	9,431,589.00
	Exchange rate	76.10	23.57	29.37	118.35
	Inflation rate	7.33	3.55	2.27	17.15
	Foreign Direct Investment net inflows (% of GDP)	0.22	0.22	-0.10	0.68
	Broad Money Growth (annual %)	18.09	7.04	2.66	38.84
Pakistan	Economic growth (%)	5.75	7.40	-10.93	21.30

Country	Variables	Mean	Standard Dev.	Min.	Max.
	Agricultural production (1000 US\$)	33,700,000.00	8,528,844.00	20,700,000.00	48,400,000.00
	Exchange rate	72.93	39.30	21.71	162.91
	Inflation rate	8.49	3.95	2.53	20.29
	Foreign Direct Investment net inflows (% of GDP)	1.05	0.81	0.38	3.67
	Broad Money Growth (annual %)	15.66	6.96	4.31	42.91

Sources: Agricultural Production is from Food and Agriculture Organization Statistics. Economic Growth, Exchange Rate, Inflation Rate, Foreign Direct Investment, and Broad Money Growth are from World Bank Open Data.

### Methodology: Autoregressive Distributed Lag Model (ARDL) with Bounds Test

Autoregressive Distributed Lag (ARDL) model is used to test long-run and short-run relationships between economic time series. The autoregressive model in general has lagged values of the dependent variable. Therefore, using OLS techniques yield biased coefficient estimation. If the error term is correlated, the OLS estimates will be inconsistent (Rushdi et al., 2012). This approach can be applied to series irrespective of the order of integration whether it is  $I(0)$ ,  $I(1)$ , or mutually cointegrated (Sari et al., 2008). By integrating the error correction term into the ARDL model, we can estimate the long-run effect between variables. In addition, the ARDL model is more effective for estimating small samples compared to other time series methodologies (Pesaran and Shin 1999; Latif et al., 2015). Nkoro and Uko (2016) found that the ARDL model is also robust in a small sample size when there is a single long-run relationship between variables.

There are several conventional approaches for testing the existence of long-run relationships. Engle and Granger's (1987) approach, maximum likelihood-based Johansen and Juselius (1990), and Phillips and Hansen's (1990) fully modified OLS estimator are some techniques to estimate log-run relationships (Shahbaz and Islam, 2011). The ARDL bounds testing methodology by Pesaran and Shin (1999) and Pesaran et al. (2001) has become popular because of its advantages over conventional cointegration testing (Sam et al., 2019) ARDL bounds testing approach is better suited for small samples (Haug, 2002; Shahbaz and Islam, 2011).

The unrestricted error correction method (UECM) is used to examine the long-run and short-run relationships. Appropriate modification of the order of the ARDL model can simultaneously correct for residual serial correlation (Pesaran and Shin, 1999).

$$\begin{aligned} \Delta \ln EGR_{it} = & \alpha + \sum_{k=1}^p \delta_1 \Delta \ln EGR_{i(t-k)} + \sum_{k=0}^q \delta_2 \Delta \ln AGP_{i(t-k)} + \sum_{k=0}^q \delta_3 \Delta \ln EXGR_{i(t-k)} + \sum_{k=0}^q \delta_4 \Delta \ln IF_{i(t-k)} \\ & + \sum_{k=0}^q \delta_5 \Delta FDI_{i(t-k)} + \sum_{k=0}^q \delta_6 \Delta MGP_{i(t-k)} + \gamma_1 \ln EGR_{i(t-k)} + \gamma_2 \ln AGP_{i(t-k)} \\ & + \gamma_3 \ln EXGR_{i(t-k)} + \gamma_4 \ln IF_{i(t-k)} + \gamma_5 FDI_{i(t-k)} + \gamma_6 MGP_{i(t-k)} + \varepsilon_{it} \end{aligned} \quad (1)$$

where:  $EGR$  is the economic growth,  $AGP$  is the agricultural production,  $EXGR$  is the exchange rate,  $IF$  is the inflation rate,  $FDI$  is foreign direct investment and  $MGP$  is broad money growth.  $i$  denotes the country,  $t$  represents the time,  $k$  is the number of time lags (annual).  $p$  and  $q$  are the maximum number of dependent and independent variable lags respectively. The optimal lag length can be selected using BIC values.  $\Delta$  indicates the first difference of the variables and  $\ln$  indicates the natural logarithm. Exchange rate, inflation rate, foreign direct investment and broad money growth are the indicators that determine economic growth.

To determine the order of the series, augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests are used. Although the ADF test is widely used in time-series data analysis, it is affected by serial correlation (DeJong et al., 1992). The results of the unit root test can be found in the appendix. The  $\delta s$  refers to the short-run relationship and  $\gamma s$  to the long-run relationships. The null hypothesis of no cointegration is:  $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$ . The alternate hypothesis is:  $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$ . If the calculated F-statistics exceed the upper bound

critical value, the null hypothesis of no cointegration is rejected. If it is below the lower bound, then the null cannot be rejected. If the calculated F-statistics fall between the lower and upper bound, then cointegration is inconclusive.

## Empirical Results and Discussion

### *Unit Root and Bounds Tests*

This section presents the estimation of an ARDL model given in equation (1). The results of the ADF and PP unit root test statistics are shown in Appendix Table A1 and A2. The results of the ADF and PP tests present evidence that all the variables are nonstationary in levels. However, they become stationary after taking the first difference. Although the ARDL approach does not require testing for stationarity of the time series, the higher order integration (i.e.,  $I(2)$  or more) can result in unreliable estimates when using the ARDL model (Ouattara, 2006). Therefore, unit root testing confirms the validity of ARDL model when using South Asian economic time-series data.

The results of the  $F$ -statistics for the bounds testing are reported in Table 2. For all the countries in the South Asian region, except Bhutan,  $F$ -statistics fall outside the upper bound and are statistically significant at a 5% level. The results imply that there is a long-run relationship between agricultural production and economic growth. If such long-run relationships exist, then information on agricultural production can be used to predict economic growth.

**Table 2: ARDL bound test for cointegration**

Country	Computed F-statistics	Lower bound value	Upper bound value	Decision
Sri Lanka	11.737	3.420	5.053	Reject the null
Bangladesh	13.166	3.261	4.805	Reject the null
Bhutan	5.817	4.066	5.995	Cannot reject the null
India	7.489	3.493	5.207	Reject the null
Maldives	8.095	3.867	5.669	Reject the null
Nepal	10.679	3.970	5.816	Reject the null
Pakistan	11.405	3.943	5.824	Reject the null

*Note: Lower and upper values on the ARDL bounds test are calculated by the critical value at 5% significant level.*

**Table 3: Estimated Long-Run and Short-Run Relationships**

	$\Delta \ln_{\text{economic growth rate}}$	Sri Lanka	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan
LR	$\ln_{\text{ag\_production}}$	-1.633 (1.170)	-1.553 (1.338)	3.148 (1.697)	-0.377 (2.270)	-1.652** (0.565)	8.800* (1.215)	6.074** (2.532)
	$\ln_{\text{exchange\_rate}}$	0.519 (0.418)	3.566* (1.772)	-1.241 (1.218)	-0.756 (2.588)	-1.585 (2.933)	-10.077* (1.268)	-3.311** (1.262)
	$\ln_{\text{inflation}}$	1.030*** (0.256)	0.537** (0.195)	0.067 (0.556)	0.435 (0.649)	0.182 (0.290)	-1.084* (0.206)	1.049*** (0.313)
	$\ln_{\text{foreign\_DI}}$	0.000 (0.235)	-0.218** (0.083)	-0.583** (0.198)	0.330 (0.338)	-0.629 (0.506)	-0.124 (0.094)	-0.318 (0.227)
	$\ln_{\text{broad\_money growth\_percent}}$	0.526* (0.263)	0.375 (0.341)	-0.155 (0.244)	-0.540 (0.543)	1.782* (0.979)	-0.560 (0.438)	0.514 (0.381)
	SR	$\Delta \ln_{\text{ag\_production}}$	-1.616 (1.204)	-1.638 (1.350)	3.971 (2.237)	-0.285 (1.719)	-1.666* (0.742)	-4.079 (3.650)
$\Delta \ln_{\text{exchange\_rate}}$		-9.303*** (2.386)	-6.930** (2.598)	-23.744*** (3.772)	-14.063*** (1.812)	-12.326* (5.921)	-8.422 (3.826)	-28.539*** (4.190)
$\Delta \ln_{\text{inflation}}$		1.019*** (0.218)	0.566** (0.199)	0.085 (0.699)	-0.347 (0.379)	0.456 (0.309)	-1.355* (0.239)	0.946*** (0.261)
$\Delta \ln_{\text{foreign\_DI}}$		0.000 (0.233)	-0.230** (0.083)	-0.735** (0.292)	0.257 (0.261)	0.892 (0.689)	0.011 (0.079)	-0.287 (0.204)
$\Delta \ln_{\text{broad\_money growth\_percent}}$		0.521* (0.268)	0.395 (0.353)	-0.195 (0.319)	-0.419 (0.425)	0.549 (0.668)	-0.700 (0.517)	0.463 (0.381)
constant		21.027 (17.129)	11.795 (15.722)	-41.767 (25.873)	10.160 (25.537)	17.914* (11.065)	-109.899* (24.265)	-83.113** (30.895)
Error correction term		-0.990*** (0.146)	-1.055*** (0.142)	-1.14395 (0.222)	-0.777*** (0.177)	-1.009*** (0.219)	-1.250* (0.107)	-0.902*** (0.152)
$R^2$		0.86	0.83	0.995	0.91	0.92	0.99	0.89

Note: \*\*\*, \*\*, and \* denote the 1%, 5%, and 10% significant levels, respectively. Standard errors are presented in the numbers in parentheses.

### ***Long-run relationships***

The results of the estimated long-run relationships among variables are presented in Table 3. Results of the ARDL model show that Nepal has the highest recorded economic growth by agricultural production. A 1% increase in Nepal's agricultural production leads to an 8.8% increase in economic growth on an average ceteris paribus. Pakistan has the second-largest agricultural production concentrated economic growth compared to other countries in the South Asian region. Maldives shows an inverse relationship between agricultural production and economic growth. One possible explanation is that Maldives is an island where it is difficult to expand the scale of the agricultural economy to support its population. It means that they have to import agricultural products from foreign countries, weakening the agriculture industry.

Sri Lanka, Bangladesh, and Pakistan indicate that the inflation rate is positively correlated with economic growth whereas, for Nepal, inflation is negatively related. The relationship between inflation and economic growth remains controversial both in theory and empirical analysis (Mallik and Chowdhury, 2001). A study involving 70 countries from 1960 to 1989 found no causal relationship between inflation and economic growth in 40 percent of the countries (Paul et al., 1997). In addition, some studies found a positive relationship whereas some studies found a negative relationship between inflation and economic growth (Fischer, 1993; Barro, 1996; Bruno and Easterly, 1998). In essence, the relationship between inflation and economic growth is inconclusive.

A currency peg is a type of exchange rate regime. The relationship between economic growth and the exchange rate highlights that developing countries sometimes fixed their exchange rates to the currency of another country (i.e., the U.S. dollar) to reduce an exchange rate risk and promote economies through trade. If the country's inflation rates are higher than the foreign currency (in this case, the U.S. dollar), it may experience a current account deficit resulting in devaluations of local currencies (Ito et al., 1997). Currency devaluation is key to a recession and inflation. Since it reduces the cost of a country's export and increases the price of its import, it makes the country competitive in the global market, improving a trade imbalance. This scenario often causes an inflation devaluation spiral (Ito et al., 1997). Our results indicate that Nepal and Pakistan experience a large depreciation thus, hindering economic growth. Only Bangladesh has a positive impact on the exchange rate on economic development.

The literature has suggested that foreign direct investment has a positive impact on economic growth (Athukorala, 2003). With globalization, FDI offers fast economic growth for developing countries by providing necessary resources such as capital, technology, managerial skills, brands, and market access (Athukorala, 2003). With the progressive liberalization of FDI policies, from the mid-1990s South Asian region started to attract a significant amount of FDI. However, our findings indicate that Bangladesh and Bhutan's economic performances are negatively affected by FDI. The results are consistent with the dependency theory that suggests if a nation depends on FDI, then its economic growth would face a negative impact (Saqib et al., 2013). In addition, previous literature also suggests that in the long run, FDI exerts a significant negative effect on the host country (Hermes and Lensink, 2003; Kogid et al., 2010). Further research is needed to examine why these economies are negatively affected by FDI. However, this is beyond the scope of the current study.

The broad money growth rate can be considered as a main indicator of liquidity denoted by the amount of money available in a country. Results of the estimates show that there is a positive and significant long-run relationship between the broad money growth rate and economic growth only in Sri Lanka and Maldives. Broad money enhancing the liquidity in a country would pump more funds into the economy that would push up private sector investment and in turn accelerate economic growth (Rana and Barua, 2015). However, as the broad money growth rate is found to be insignificant suggests that those countries may look into proper channelling of the money into the economy and use it for economic activities (Rana and Barua, 2015). It is surprising to note that none of the variables are statistically significant in the Indian economy.

### ***Short-run relationships***

In the short run, economic growth seems to be decreased with an increase in the exchange rate in most countries in the South Asian region. The inflation rate is positively linked with economic growth in Sri Lanka, Bangladesh, and Pakistan. Foreign direct investment is inversely correlated with economic growth for Bangladesh and Bhutan.

The error correction term indicates the speed adjustment to restore the long-run equilibrium in the dynamic economic growth model for the South Asian region. We expect a negative and significant sign for the error correction term (Table 3). The coefficient shows how quickly variables converge to equilibrium.

## Conclusions

Even though the economy of the South Asian region is mainly based on agricultural production, the performance within the South Asian region varies from country to country. Most of the South Asian economies have been undergoing a process of economic reforms (Joshi et al., 2004). Rapid economic changes are mainly due to trade liberalization, and globalization.

This study finds evidence that only Nepal and Pakistan have a strong agricultural production sector to support their economic growth in the long run. According to (Johnston and Mellor, 1961), agriculture contributes to economic growth via increased demand for agricultural products, expansion of agricultural exports, providing capital for investment, rising net cash incomes, and transfer of labour from agriculture to nonagricultural sectors. These findings also have implications for Nepal's and Pakistan's agricultural policies aimed at stimulating growth and development through agricultural expansion. Investments in agricultural research and extension programmes may be appropriate.

We, however, do not find strong evidence that the economic growth of Sri Lanka, Bhutan, Bangladesh, Maldives, and India depends on agricultural production. The influx of subsidized cheap products through imports from foreign countries, slow technological advances in staple crops, and declining investment in agriculture seem to have a significant impact on the declining impact of agricultural production on economic growth in these countries (Joshi et al., 2004). In addition, agricultural production is likely to play a significant role in economic growth only in countries with good agroecological conditions, limited prospects for export earnings from industrial goods, and the agriculture sector is dominated by small farms (Diao et al., 2010).

The study findings have important policy implications. We find that inflation has a positive impact on Sri Lanka, Bangladesh, and Pakistan's economic growth. This indicates that inflation is helpful for economic growth rather than harmful. The study findings are consistent with previous research that find a positive impact of inflation on economic growth (Mallik and Chowdhury, 2001). In addition, this finding also agrees with *structuralists'* argument that inflation is essential for economic growth. However, the larger elasticities are concerning and should be interpreted carefully as higher inflation may cause inflationary spirals beyond a safer level (Mallik and Chowdhury, 2001).

South Asian countries have been experiencing a transformation from agricultural economies to manufacturing, export-oriented economies. That might be the reason that we do not observe a strong correlation between agricultural production and economic growth. The success of those countries might be based on industrial and trade sectors. The countries are moving from low-value-added goods sectors and commodity marketing to high-value-added goods (Ito et al., 1997).



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## Appendix

**Table A1: Results of augmented Dickey Fuller test**

Country	Variable	ADF Statistics	Test Critical Value (5%)	Decision
<b>Sri Lanka</b>	Ln_Econ. Growth	-2.287	-1.721	Stationary
	Ln_Ag Production	-2.585	-1.714	Stationary
	Ln Exchange Rate	-1.491	-1.714	Non-stationary
	Ln Inflation Rate	-0.508	-1.714	Non-stationary
	Ln Foreign Direct Investment	1.116	-1.717	Non-stationary
	Ln Broad money growth rate	0.702	-1.771	Non-stationary
	$\Delta$ Ln_Econ. Growth	-7.040	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-7.226	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-5.077	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-7.478	-2.986	Stationary
<b>Bangladesh</b>	$\Delta$ Ln Foreign Direct Investment	-5.355	-2.986	Stationary
	$\Delta$ Ln Broad money growth rate	-9.356	-2.992	Stationary
	Ln_Econ. Growth	-1.089	-1.740	Non-stationary
	Ln_Ag Production	-0.654	-1.717	Non-stationary
	Ln Exchange Rate	-2.120	-1.714	Stationary
	Ln Inflation Rate	-1.888	-1.714	Stationary
	Ln Foreign Direct Investment	-2.026	-1.714	Stationary
	Ln Broad money growth rate	-2.831	-1.717	Stationary
	$\Delta$ Ln_Econ. Growth	-7.330	-2.997	Stationary
	$\Delta$ Ln_Ag Production	-6.026	-2.989	Stationary
<b>Bhutan</b>	$\Delta$ Ln Exchange Rate	-3.982	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-6.285	-2.986	Stationary
	$\Delta$ Ln Foreign Direct Investment	-5.129	-2.986	Stationary
	$\Delta$ Ln Broad money growth rate	-7.239	-2.989	Stationary
	Ln_Econ. Growth	-1.080	-1.812	Non-stationary
	Ln_Ag Production	-1.977	-1.717	Non-stationary
	Ln Exchange Rate	-0.462	-1.714	Non-stationary
	Ln Inflation Rate	-2.918	-1.714	Non-stationary
	Ln Foreign Direct Investment	-1.087	-1.943	Non-stationary
	Ln Broad money growth rate	-1.970	-1.717	Stationary
<b>India</b>	$\Delta$ Ln_Econ. Growth	-5.285	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-5.243	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-4.983	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-6.065	-2.986	Stationary
	$\Delta$ Ln Foreign Direct Investment	-6.045	-3.000	Stationary
	$\Delta$ Ln Broad money growth rate	-12.510	-2.989	Stationary
	Ln_Econ. Growth	-1.535	-1.782	Non-stationary
	Ln_Ag Production	0.596	-1.717	Non-stationary
	Ln Exchange Rate	-0.464	-1.714	Non-stationary
	Ln Inflation Rate	-1.953	-1.714	Stationary
<b>Maldives</b>	Ln Foreign Direct Investment	-2.617	-1.714	Stationary
	Ln Broad money growth rate	-1.465	-1.717	Non-stationary
	$\Delta$ Ln_Econ. Growth	-7.390	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-7.855	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-4.982	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-7.003	-2.989	Stationary
	$\Delta$ Ln Foreign Direct Investment	-4.982	-2.986	Stationary
	$\Delta$ Ln Broad money growth rate	-7.003	-2.986	Stationary
	Ln_Econ. Growth	-1.948	-1.746	Stationary
	Ln_Ag Production	-0.879	-1.717	Non-stationary
Ln Exchange Rate	-1.107	-1.714	Non-stationary	
Ln Inflation Rate	-0.920	-1.860	Non-stationary	
Ln Foreign Direct Investment	-0.701	-1.714	Non-stationary	
Ln Broad money growth rate	-2.395	-1.740	Stationary	
$\Delta$ Ln_Econ. Growth	-6.387	-3.000	Stationary	

	$\Delta \text{Ln\_Ag Production}$	-4.705	-2.989	Stationary
	$\Delta \text{Ln Exchange Rate}$	-4.105	-2.986	Stationary
	$\Delta \text{Ln Inflation Rate}$	-3.741	-3.000	Stationary
	$\Delta \text{Ln Foreign Direct Investment}$	-7.736	-2.986	Stationary
	$\Delta \text{Ln Broad money growth rate}$	-7.056	-2.997	Stationary
<b>Nepal</b>	$\text{Ln\_Econ. Growth}$	-2.958	-1.833	Stationary
	$\text{Ln\_Ag Production}$	-0.083	-1.717	Non-stationary
	$\text{Ln Exchange Rate}$	-0.499	-1.714	Non-stationary
	$\text{Ln Inflation Rate}$	-1.971	-1.714	
	$\text{Ln Foreign Direct Investment}$	-1.894	-1.943	Non-stationary
	$\text{Ln Broad money growth rate}$	-2.434	-1.717	Stationary
	$\Delta \text{Ln\_Econ. Growth}$	-8.796	-3.000	Stationary
	$\Delta \text{Ln\_Ag Production}$	-8.465	-2.989	Stationary
	$\Delta \text{Ln Exchange Rate}$	-4.819	-2.986	Stationary
	$\Delta \text{Ln Inflation Rate}$	-8.027	-2.986	Stationary
	$\Delta \text{Ln Foreign Direct Investment}$	-5.238	-3.000	Stationary
	$\Delta \text{Ln Broad money growth rate}$	-8.655	-2.989	Stationary
<b>Pakistan</b>	$\text{Ln\_Econ. Growth}$	-1.187	-2.920	Stationary
	$\text{Ln\_Ag Production}$	-0.866	-1.717	Non-stationary
	$\text{Ln Exchange Rate}$	-0.496	-1.714	Non-stationary
	$\text{Ln Inflation Rate}$	-2.931	-1.714	Stationary
	$\text{Ln Foreign Direct Investment}$	-3.699	-1.714	Stationary
	$\text{Ln Broad money growth rate}$	-2.684	-1.717	Stationary
	$\Delta \text{Ln\_Econ. Growth}$	-4.373	-3.000	Stationary
	$\Delta \text{Ln\_Ag Production}$	-7.844	-2.989	Stationary
	$\Delta \text{Ln Exchange Rate}$	-3.676	-2.986	Stationary
	$\Delta \text{Ln Inflation Rate}$	-5.798	-2.986	Stationary
	$\Delta \text{Ln Foreign Direct Investment}$	-4.911	-2.986	Stationary
	$\Delta \text{Ln Broad money growth rate}$	-6.230	-2.625	Stationary

**Table A2: Results of Phillips–Perron unit-root test**

Country	Variable	Test Statistics	Test Critical Value (5%)	Decision
<b>Sri Lanka</b>	Ln_Econ. Growth	-2.121	-3.000	Non-stationary
	Ln_Ag Production	-1.333	-2.986	Non-stationary
	Ln Exchange Rate	-0.909	-2.983	Non-stationary
	Ln Inflation Rate	-3.757	-2.983	Stationary
	Ln Foreign Direct Investment	-3.946	-2.983	Stationary
	Ln Broad money growth rate	-4.263	-2.989	Stationary
	ΔLn_Econ. Growth	-8.834	-3.000	Stationary
	ΔLn_Ag Production	-7.650	-2.989	Stationary
	ΔLn Exchange Rate	-5.134	-2.986	Stationary
	ΔLn Inflation Rate	-9.622	-2.986	Stationary
<b>Bangladesh</b>	Ln_Econ. Growth	-2.952	-2.992	Non-stationary
	Ln_Ag Production	-0.169	-2.986	Non-stationary
	Ln Exchange Rate	-2.339	-2.983	Non-stationary
	Ln Inflation Rate	-3.581	-2.983	Stationary
	Ln Foreign Direct Investment	-2.037	-2.983	Non-stationary
	Ln Broad money growth rate	-3.814	-2.986	Stationary
	ΔLn_Econ. Growth	-8.090	-2.997	Stationary
	ΔLn_Ag Production	-6.056	-2.989	Stationary
	ΔLn Exchange Rate	-3.852	-2.986	Stationary
	ΔLn Inflation Rate	-7.470	-2.986	Stationary
<b>Bhutan</b>	Ln_Econ. Growth	-4.170	-3.000	Stationary
	Ln_Ag Production	-3.395	-2.986	Stationary
	Ln Exchange Rate	-3.238	-2.983	Stationary
	Ln Inflation Rate	-2.388	-2.983	Non-stationary
	Ln Foreign Direct Investment	-5.753	-3.000	Stationary
	Ln Broad money growth rate	-6.193	-2.986	Stationary
	ΔLn_Econ. Growth	-6.150	-3.000	Stationary
	ΔLn_Ag Production	-5.414	-2.989	Stationary
	ΔLn Exchange Rate	-5.082	-2.986	Stationary
	ΔLn Inflation Rate	-6.105	-2.986	Stationary
<b>India</b>	Ln_Econ. Growth	-3.751	-3.000	Non-stationary
	Ln_Ag Production	0.319	-2.986	Non-stationary
	Ln Exchange Rate	-3.239	-2.983	Stationary
	Ln Inflation Rate	-2.289	-2.983	Non-stationary
	Ln Foreign Direct Investment	-2.466	-2.983	Non-stationary
	Ln Broad money growth rate	-2.615	-2.986	Non-stationary
	ΔLn_Econ. Growth	-7.900	-3.000	Stationary
	ΔLn_Ag Production	-8.117	-2.989	Stationary
	ΔLn Exchange Rate	-5.082	-2.986	Stationary
	ΔLn Inflation Rate	-6.981	-2.986	Stationary

<b>Maldives</b>	Ln_Econ. Growth	-3.832	-2.994	Stationary
	Ln_Ag Production	-0.911	-2.986	Non-stationary
	Ln Exchange Rate	-2.092	-2.983	Non-stationary
	Ln Inflation Rate	-3.037	-3.000	Stationary
	Ln Foreign Direct Investment	-1.026	-2.983	Non-stationary
	Ln Broad money growth rate	-3.625	-2.992	Stationary
	$\Delta$ Ln_Econ. Growth	-6.832	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-4.708	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-4.049	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-3.712	-3.000	Stationary
	$\Delta$ Ln Foreign Direct Investment	-8.203	-2.986	Stationary
<b>Nepal</b>	$\Delta$ Ln Broad money growth rate	-7.263	-2.997	Stationary
	Ln_Econ. Growth	-4.477	-3.000	Stationary
	Ln_Ag Production	0.389	-2.986	Non-stationary
	Ln Exchange Rate	-3.053	-2.983	Stationary
	Ln Inflation Rate	-3.502	-2.983	Stationary
	Ln Foreign Direct Investment	-2.352	-3.000	Non-stationary
	Ln Broad money growth rate	-4.630	-2.986	Stationary
	$\Delta$ Ln_Econ. Growth	-10.739	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-8.830	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-4.894	-2.986	Stationary
	$\Delta$ Ln Inflation Rate	-9.548	-2.986	Stationary
<b>Pakistan</b>	$\Delta$ Ln Foreign Direct Investment	-5.045	-3.000	Stationary
	$\Delta$ Ln Broad money growth rate	-10.299	-2.989	Stationary
	Ln_Econ. Growth	-1.841	-3.000	Non-stationary
	Ln_Ag Production	-0.992	-2.986	Non-stationary
	Ln Exchange Rate	-0.923	-2.983	Non-stationary
	Ln Inflation Rate	-2.380	-2.983	Non-stationary
	Ln Foreign Direct Investment	-2.352	-2.983	Non-stationary
	Ln Broad money growth rate	-3.855	-2.986	Stationary
	$\Delta$ Ln_Econ. Growth	-5.681	-3.000	Stationary
	$\Delta$ Ln_Ag Production	-9.244	-2.989	Stationary
	$\Delta$ Ln Exchange Rate	-3.542	-2.986	Stationary
$\Delta$ Ln Inflation Rate	-5.786	-2.986	Stationary	
$\Delta$ Ln Foreign Direct Investment	-4.930	-2.986	Stationary	
$\Delta$ Ln Broad money growth rate	-7.213	-2.989	Stationary	