Contribution of Tax Revenue to the GDP of Bangladesh: A Comparative Study with Developing and Developed Countries

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ABSTRACT

The study intends to compare the level of tax revenue contribution to the GDP of Bangladesh with SAARC countries and some groups of countries and the world average. Descriptive statistics have been used to determine the comparative scenario. The independent sample t-test is applied to examine the relationship using secondary sources of data collected from the world development indicators of the World Bank. The statistical results indicate that the Tax-to-GDP ratio of Bangladesh is the lowest among SAARC countries, the south Asian average, and the world average and far behind OECD and developed countries' average. The research adds value to the public finance literature and provides a message to policy planners and practising authorities.

Keywords: Comparative Tax-to-GDP ratio; Contribution; SAARC countries; Bangladesh.

1.0 Introduction

Most of the Asian countries are suffering from inadequacy of financing needs and low Tax-to-GDP ratio than cross-country average due to different reasons. Government revenue collection has been rising in the amount and percentage of GDP in maximum low and lower-middle income countries. Some of the SAARC countries have been moderately successful in increasing the Tax-to-GDP but remains inadequate to meet the government expenditure. Literature supports that Tax-to-GDP of Bangladesh is lowest among SAARC, South Asian, lower-middle income countries and far below then high-income, OECD member countries and world average. Bangladesh has also been suffering from deficit financing and the amount and percentage of budget deficit has been gradually increasing in recent years.

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There are some long-term negative effects of budget deficit including tax burden is shifting from high income to low-income group of people. All of the consequences are contradictory to the canon of taxation. However, there is hardly any study regarding the issue. So, the matter is imperative to find out the comparative scenario of the contribution of Tax-to-GDP of Bangladesh with SAARC countries and different countries groups. Furthermore, the study is expected to enrich the literature on public finance and provide valuable guidelines to the policymakers to take suitable policies and practising authorities to implement the same to reduce the budget deficit.

2.0 Review of Literature

Tax-to-GDP ratios in most South Asian countries remain below than the cross-country averages and are considered inadequate to meet their financial needs (Gupta, 2015). The ratios in developing countries are still meager for many reasons, including low tax compliance (Santoro & Mdluli, 2019). Afghanistan, Bhutan, Nepal and Maldives, have been moderately successful in increasing the ratio (Gupta, 2015). However, revenue collection has been rising in absolute figures and as a percentage of the GDP in most of the low and lower-middle-income countries during the last decade but, it remains insufficient to meet up the financing needs of the SDGs (Ahmed, 2019). Shortcomings in administrative capability also relate to low fiscal capacity (Pirttilä & Tarp, 2019).

Personal income and property tax collection in East Asia was, on an average, four times higher as a proportion of national income than Latin America during 1997-2002 (John, 2006). Tax income as a share of GDP has risen highly in the developed countries with passes of time, but the growth level shows a stable condition in Bangladesh (Ahmed, 2019). However, the mean Tax-to-GDP of Bangladesh is lowest among SAARC countries except Afghanistan (Sarkar, 2022a). The Eastern European economies had more than double the income tax collection as a share of GDP compared with Latin America (John, 2006). Higher public savings as a percentage of GDP is correlated with higher growth rates in less developed countries (Kriekhaus, 2002). For example, the East Asian average savings rate is more than double as a percentage of GDP compared with South Asia and sub-Saharan Africa and two-thirds higher than Latin America (Kriekhaus, 2002, cited in John, 2006).

Low-income countries are likely to have lower-quality institutions, and the governments face constraints in developing countries are in many ways different from those in their high-income counterparts (Pirttilä & Tarp, 2019). For example, over five years, about 30 per cent of corporate income tax returns are nil every year, whereas about

45 per cent of taxpayers' nil-filling in at least one year over the five years in Eswatini (Santoro & Mdluli, 2019).

As far as the tax burden approximated by tax quota is concerned, the unfriendly relationship between economic growth and personal income taxes, corporate taxation and social security contributions are varied in OECD countries (Macek, 2014). On the other hand, government expenditure does not increase the annual GDP growth rate in the EU-28 member states, while total tax revenues seem to be less harmful to the growth. In this line, balanced budgets are predicted to be growth-friendly (Stoilova, 2017). However, the total budget deficit is 6.0 per cent of GDP in the FY 2020-2021 that was 5.0 per cent in the early FY in Bangladesh (GOB, 2020).

For a long, Bangladesh has had one of the world's lowest Tax-to-GDP ratios and one of the weakest among its neighbouring countries and similar economies (Alam *et al.*, 2017). For instance, the mean Tax-GDP ratio of Bangladesh (7.91) is mentionable lower than Bhutan (11.39), India (10.39), Maldives (10.60), Nepal (13.32), and Sri Lanka (12.51), the South Asian countries (10.31), lower-middle-income countries (12.01), and far behind high income (15.67), OECD members (15.73), and World (14.79) average (Sarkar, 2022a). Government revenue of Bangladesh will deteriorate as a result of the tax rate reform through the Finance Act 2020 which will leading to the budget deficit (Sarkar, 2022). The Tax-to-GDP ratio remains low in Pakistan and Sri Lanka, and after some initial increase, it has begun to stagnate in Bangladesh and India (Gupta, 2015). However, the number of income tax assesses, income tax revenue, and income tax to GDP ratio showed an upward trend in India because of the government policies and strategies (Joshitta *et al.*, 2013). The government of the people's republic of Bangladesh need to finance the deficit budget by taking loans leads to shifting tax load to low-income public as a hidden tax in the long-term (Sarkar, 2022).

3.0 Objective of the Study

The study is an attempt to find out the comparative scenario of Tax-to-GDP of Bangladesh with SAARC countries and different countries groups.

4.0 Methodology of the Study

The research is empirically based on secondary data collected from the world development indicators of World Bank.

4.1 Data and period

Data on tax revenue as a percentage of GDP (Tax-GDP ratio) from 2001 to 2018 of all SAARC countries collected from world development indicators of World Bank. Same data of different country groups such as low-medium income, OECD, high-income, south Asian and World average also collected from the same source. Data of Pakistan was not available in that source so that Pakistan is excluded in the analysis.

4.2 Filled up data gap

Data of Afghanistan from 2001 to 2005 and 2018, Bangladesh 2017 to 2018, and the Maldives 2010 to 2018 were not available in the source. Therefore, the researcher filled up the data gap to show the graphical presentation of the comparative scenario. Graphical representation showed here with filled up data by trend value. Here, statistical analysis is given using accurate data, i.e., data was not filled up here.

4.3 Data analysis techniques

The researcher used descriptive statistics to show the comparative scenario of Tax-to-GDP ratio of Bangladesh with SAARC countries, World, OECD, high income, south Asian, and low-middle-income countries. Independent sample t-test is also presented to test the relationship of Tax-to-GDP ratio of Bangladesh with above mentioned countries and group of countries. Data are presented in tables and figures to make it easily understandable.

5.0 Test of Normality of Data Set

The pre-condition of conducting a parametric test to be reliable is that the data set is approximately normally distributed. So, the first task is to check whether the data set is normally distributed or not. The sample size is 9 to 19, so the Shapiro-Wilk test should be used because it is appropriate in the case of a small sample. For example, the Shapiro-Wilk test p-value (Table 1) of Bangladesh is o.042, Bhutan 0.040 and Nepal 0.040 <0.05, indicating a non-normal distribution of data.

The normality test of the data was again conducted after log transformation of the dependent variable of Tax-to-GDP. The result of the Shapiro-Wilk test showed that the p-value (Table 2) of all countries and groups of countries are >0.05 except Bhutan. So, normality can be assumed for this data set, and an appropriate parametric test can be used. An independent sample t-test is used here to examine the relationship of the tax revenue of Bangladesh as a percentage of GDP with other SAARC countries and some groups of countries.

Table 1: Tests of Normality[c]

	Country Name	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Tax Revenue (% of GDP)	Afghanistan	0.117	12	0.200*	0.969	12	0.896
	Bangladesh	0.195	16	0.105	0.882	16	0.042
	Bhutan	0.235	18	0.010	0.891	18	0.040
	India	0.106	18	0.200*	0.973	18	0.850
	Maldives	0.240	9	0.145	0.883	9	0.170
	Nepal	0.165	19	0.186	0.895	19	0.040
	Sri Lanka	0.082	19	0.200*	0.959	19	0.554
	European Union	0.108	19	0.200*	0.955	19	0.486
	High income	0.123	19	0.200*	0.973	19	0.836
	OECD members	0.175	19	0.127	0.955	19	0.483
	Middle income	0.209	11	0.197	0.904	11	0.207
	Lower middle income	0.146	18	0.200*	0.954	18	0.493
	South Asia	0.094	18	0.200*	0.983	18	0.973
	World	0.130	19	0.200*	0.972	19	0.823
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction; c. There are no valid cases for Tax Revenue (% of GDP) when Country Name = 7.000. Statistics cannot be computed for this level.							

Source: Analysis of data collected from world development indicators of World Bank. Last Updated: 26/04/2021

Table 2: Tests of Normality[c]

	Country Name	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
LogTax Revenue (% of GDP)	Afghanistan	0.119	12	0.200*	0.958	12	0.759
	Bangladesh	0.189	16	0.129	0.888	16	0.052
	Bhutan	0.212	18	0.032	0.892	18	0.042
	India	0.116	18	0.200*	0.957	18	0.541
	Maldives	0.243	9	0.135	0.885	9	0.175
	Nepal	0.156	19	0.200*	0.903	19	0.054
	Sri Lanka	0.089	19	0.200*	0.954	19	0.468
	European Union	0.108	19	0.200*	0.955	19	0.477
	High income	0.130	19	0.200*	0.968	19	0.745
	OECD members	0.182	19	0.099	0.948	19	0.367
	Middle income	0.207	11	0.200*	0.905	11	0.212
	Lower middle income	0.162	18	0.200*	0.940	18	0.294
	South Asia	0.106	18	0.200*	0.970	18	0.795
	World	0.135	19	0.200*	0.973	19	0.834
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction; c. There are no valid cases for Log_Tax Revenue (% of GDP) when Country Name = 7.000. Statistics cannot be computed for this level.							

Source: Analysis of data collected from world development indicators of World Bank. Last Updated: 26/04/2021

6.0 Results and Discussion

The result is presented and discussed after divided it into two parts. Descriptive statistics are shown in the table and give a brief description in the first part. A comparative scenario is presented among SAARC countries except for Pakistan in the second part. In addition, a relative status of Bangladesh with the World, OECD, high income, south Asian and low middle-income countries is also presented in the second part.

6.1 Descriptive statistics

Table 3 presents descriptive statistics such as the mean, standard deviation, minimum, maximum, and range of tax revenue to GDP.

Table 3: Descriptive Statistics of Tax to GDP Ratio

Country	Obs.	Mean	Std. Dev.	Min.	Max.	Range
Afghanistan	12	7.80	1.42	5.28	9.90	4.62
Bangladesh	18	7.91	0.88	6.61	9.40	2.79
Bhutan	18	11.39	2.78	7.70	16.02	8.32
India	18	10.39	1.08	8.08	12.11	4.03
Maldives	09	10.60	1.18	9.10	12.15	3.05
Nepal	19	13.32	4.40	8.56	21.66	13.10
Sri Lanka	19	12.51	1.41	10.14	14.63	4.49
South Asia	18	10.31	1.03	8.17	12.06	3.89
Lower middle income	18	12.01	0.95	10.00	13.44	3.44
High income	19	15.67	0.57	14.47	16.63	2.15
OECD members	19	15.73	0.59	14.36	16.62	2.25
World	19	14.79	0.51	13.72	15.96	2.23

Source: Analysis of data collected from world development indicators of World Bank. Last Updated: 26/04/2021

The mean value of tax as a percentage of GDP in Bangladesh is lower among SAARC countries except for Afghanistan. The mean value of the Tax-GDP ratio of Bangladesh (7.91) is about equal to Afghanistan (7.80) but mentionable lower than Bhutan (11.39), India (10.39), Maldives (10.60), Nepal (13.32), and Sri Lanka (12.51). The mean ratio of Bangladesh is also mentionable below that of the average of South Asian countries (10.31), lower-middle-income countries (12.01), and far behind high income (15.67), OECD members (15.73), and World (14.79) average.

6.2 Time series value

The trend of Tax-GDP ratio is presented here dividing into two parts. In the first part, a comparative scenario among SAARC countries is presented. In the second part, a comparative scenario of Bangladesh presented with lower middle income, south Asia, high income, OECD member countries and World average.

Table 4: Time Series Value of Tax-GDP Ratio

|	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Sri Lanka	Lower middle income	High income	South Asia	OECD members	World
2001	5.21	6.61	8.80	8.08	9.83	8.80	14.63	10.00	16.63	8.17	16.62	15.96
2002	5.48	6.69	9.54	8.68	9.51	8.56	14.02	10.44	15.54	8.69	15.52	14.96
2003	5.74	6.97	9.64	9.11	9.42	8.65	12.71	10.73	15.27	9.06	15.21	14.77
2004	6.01	7.05	7.91	9.57	10.49	8.97	13.47	11.11	15.28	9.50	15.26	14.85
2005	6.28	7.14	8.58	10.08	11.57	9.18	13.73	11.73	15.93	9.98	15.90	14.80
2006	6.97	7.04	9.27	11.13	11.76	8.78	14.58	12.93	16.36	10.90	16.33	15.26
2007	5.28	6.92	7.70	12.11	12.15	9.77	14.22	13.44	16.46	11.74	16.43	15.45
2008	6.09	7.66	8.63	10.98	11.58	10.44	13.28	13.10	15.99	10.77	15.80	15.00
2009	8.48	7.50	9.47	9.81	9.10	11.84	12.80	11.82	14.47	9.74	14.37	13.72
2010	9.17	7.83	13.46	10.39	8.25	13.40	11.30	12.04	14.68	10.26	14.75	13.97
2011	8.92	8.69	13.84	10.18	8.07	13.26	11.26	12.18	15.07	10.13	15.23	14.33
2012	7.71	9.02	15.05	10.84	7.88	13.86	10.41	12.38	15.28	10.71	15.42	14.44
2013	7.12	8.96	14.72	11.00	7.69	15.29	10.49	12.27	15.66	10.86	15.81	14.66
2014	6.88	8.64	13.70	9.98	7.51	15.90	10.14	11.69	15.81	9.92	15.97	14.66
2015	7.59	8.50	13.26	10.57	7.32	16.71	12.38	12.15	15.90	10.51	16.13	14.68
2016	9.50	8.77	12.98	11.15	7.13	18.69	12.20	12.30	15.84	11.07	16.08	14.59
2017	9.90	9.01	12.54	11.38	6.95	20.71	12.53	12.68	16.19	11.49	16.40	14.91
2018	9.74	9.40	16.02	11.97	6.76	21.66	11.92	13.22	15.66	12.06	15.81	14.58

Source: Database of world development indicators (modified) last updated: 26/04/2021

6.2.1 Comparative scenario among SAARC countries

Figure 1 and Table 4 indicate that the Tax-GDP ratio is lowest in Bangladesh during the study period except for Afghanistan and Maldives. It should mention here that the figure is presented based on a filled-up data gap using the trend Tax-GDP ratio from 2001 to 2005 and 2018 in Afghanistan, and 2010 to 2018 in the Maldives. The Tax-GDP ratio of Afghanistan from 2001 to 2005 in the figure showed a lower position than

Bangladesh, but it may not be a real scenario because the actual data of Afghanistan from 2001 to 2005 was absent. Therefore, the trend Tax-GDP ratio was used from 2001 to 2005 to make the comparative graphical presentation. Accurate Tax-GDP data from 2010 to 2018 was also absent, so the trend of the Tax-GDP ratio of Maldives was used in the figure-1. The Tax-GDP ratio of Bangladesh from 2012 to 2018 was better than in earlier years. The Tax-GDP ratio of Nepal is in a rapidly rising trend among SAARC countries, and Bangladesh is far away from Nepal. The percentage of Bhutan is also in an inconsistent (SD 2.78 and range 8.32) but increasing direction. There is a consistency of the ratio in India except 2007, but the ratio is higher than Bangladesh over the study period. The Tax-GDP ratio of Sri Lanka (12.51) is far better than Bangladesh (7.91) but has a mentionable downward trend from 2008.

Figure 1: Comparative Scenario of Tax-GDP Ratio among SAARC Countries
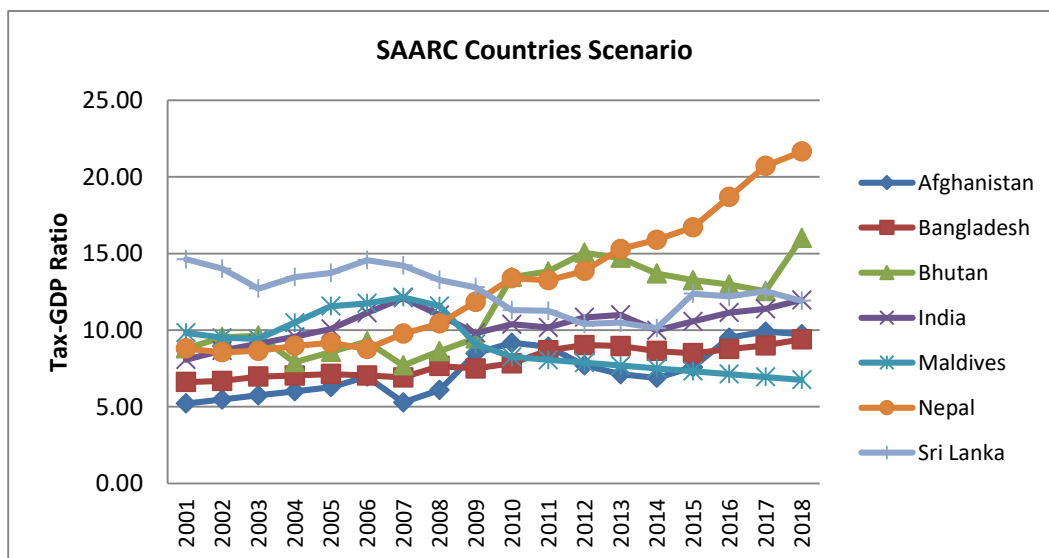
Source: Analysis of world development indicators' data of World Bank (filled up with trend value).

6.3 Independent sample t-test

An independent sample t-test was used to compare the scenario of Tax-to-GDP of Bangladesh with other SAARC countries and average of countries group.

6.3.1 Comparative scenario among SAARC countries

Comparative scenario of Tax-to-GDP of Bangladesh is presented with each of the SAARC countries using independent sample t test.

(i) Bangladesh and Afghanistan

Table 3 indicates that the mean Tax-to-GDP ratio of Bangladesh (7.91) is higher than Afghanistan (7.80). The group statistics (Table 5) indicate that the contribution of Tax-to-GDP in Bangladesh (M = 0.887, SD = 0.049) was higher than Afghanistan (M = 0.885, SD = 0.082). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Afghanistan.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Afghanistan.

Table 5: Group Statistics

	Country Name	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
LogTax Revenue (% of GDP)	Afghanistan	12	0.885185	0.0822504	0.0237437
	Bangladesh	16	0.886616	0.0488231	0.0122058

Source: Analysis of data

The significance level of Levine's test (Table 6) is 0.099, which is greater than 0.05. Therefore, we should consider the first line of the output table in that situation, i.e. equal variances assumed. The result indicates no significant difference in tax revenue to GDP between Bangladesh and Afghanistan.

Table 6: Independent Samples Test between Bangladesh and Afghanistan

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**Df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Tax Revenue (% of GDP)	Equal variances assumed	2.927	.099	-.058	26	.955	-.0014314	.0248586	-.0525291	.0496662
	Equal variances not assumed			-.054	16.725	.958	-.0014314	.0266972	-.0578282	.0549653

Source: Analysis of data

The t (26) statistic value is -0.058, and the p-value is displayed 0.955. Therefore, the null hypothesis is formally accepted with 95% confidence since p >0.05. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically insignificant. The sample provides strong enough evidence that the two population mean are equal. Therefore, the population mean of Bangladesh and Afghanistan are not different.

(ii) Bangladesh and Bhutan

Descriptive analysis (Table 3) indicate that the mean Tax-to-GDP ratio of Bhutan is mentionable higher (3.84 or 44.00 per cent) than Bangladesh. The group statistics (Table 7) indicate that the contribution of Tax-to-GDP in Bangladesh (M = 0.887, SD = 0.049) was lower than Bhutan (M = 1.044, SD = 0.108). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Bhutan.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Bhutan.

The significance level of Levine's test (Table 8) is 0.0001, which is less than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates that there is a significant difference in tax revenue to GDP between Bangladesh and Bhutan.

Table 7: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue	Bangladesh	16	0.886616	0.0488231	0.0122058
(% of GDP)	Bhutan	18	1.044232	0.1074956	0.0253370

Source: Analysis of data

Table 8: Independent Samples Test between Bangladesh and Bhutan

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
LogTax Revenue (% of GDP)	Equal variances assumed	33.723	.000	-5.385	32	.000	-.1576156	.0292681	-.2172329	-.0979983
	Equal variances not assumed			-5.604	24.321	.000	-.1576156	.0281237	-.2156195	-.0996117

Source: Analysis of data

The t (32) statistic value is -5.604, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since p <0.05. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically significant. The sample provides strong enough evidence that the two-population mean are not equal. Therefore, the population mean of Bangladesh and Bhutan are different.

(iii) Bangladesh and India

Descriptive analysis (Table 3) indicates that the mean Tax-to-GDP ratio of India is mentionable higher than (2.84 or 35.90 per cent) Bangladesh. The group statistics (Table 9) indicate that the contribution of Tax-to-GDP in Bangladesh (M = 0.887, SD = 0.049) was lower than India (M = 1.014, SD = 0.046). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and India.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and India.

Table 9: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	India	18	1.014266	0.0465616	0.0109747

Source: Analysis of data

Table 10: Independent Samples Test between Bangladesh and India

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
LogTax Revenue (% of GDP)	Equal variances assumed	0.607	.442	-7.799	32	.000	-.1276500	.0163670	-.1609885	-.0943114
	Equal variances not assumed			-7.777	31.114	.000	-.1276500	.0164141	-.1611219	-.0941781

Source: Analysis of data

The significance level of Levine's test (Table 10) is 0.442, which is more than 0.05. Therefore, we should consider the first line of the output table in that situation, i.e. equal variances assumed. The result indicates that there is no significant difference in tax revenue to GDP between Bangladesh and India.

The t (32) statistic value is -7.799, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since $p < 0.05$. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and India are different.

(iv) Bangladesh and Maldives

Table 3 indicates that the mean Tax-to-GDP ratio of Maldives is so much higher than (2.69 or 34.00 per cent) Bangladesh. The group statistics (Table 11) indicate that the contribution of Tax-to-GDP in Bangladesh (M = 0.887, SD = 0.049) was lower than Maldives (M = 1.023, SD = 0.048). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Maldives.
H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Maldives.

Table 11: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	Maldives	9	1.022902	0.0483900	0.0161300

Source: Analysis of data

The significance level of Levine's test (Table 12) is 0.943, which is greater than 0.05. Therefore, we should consider the first line of the output table in that situation, i.e. equal variances assumed. The result indicates no significant difference in tax revenue to GDP between Bangladesh and Maldives.

The t (23) statistic value is -6.720, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since $p < 0.05$. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and Maldives are different.

Table 12: Independent Samples Test between Bangladesh and Maldives

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
LogTax Revenue (% of GDP)	Equal variances assumed	0.005	.943	-6.720	23	.000	-.1362864	.0202804	-.1782395	-.0943332
	Equal variances not assumed			-6.738	16.840	.000	-.1362864	.0202277	-.1789939	-.0935788

Source: Analysis of data

(v) Bangladesh and Nepal

From the Table 3, it is found that the mean Tax-to-GDP ratio of Bangladesh is far behind than (5.41 or 68.39 per cent) Nepal. The group statistics (Table 13) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than Nepal (M = 1.103, SD = 0.141). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Nepal.
H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Nepal.

Table 13: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	Nepal	19	1.102577	0.1412066	0.0323950

Source: Analysis of data

The significance level of Levine's test (Table 14) is 0.0001, which is smaller than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates a significant difference in tax revenue to GDP between Bangladesh and Nepal.

Table 14: Independent Samples Test between Bangladesh and Nepal

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**		
									Lower	**Upper**	
LogTax Revenue (% of GDP)	Equal variances assumed	23.433	.000	-5.820	33	.000	-.2159605	.0371068	-.2914549	-.1404662	
	Equal variances not assumed			-6.238	22.919	.000	-.2159605	.0346182	-.2875877	-.1443334	

Source: Analysis of data

The t (33) statistic value is -6.238, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since $p < 0.05$. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and Nepal are different.

(vi) Bangladesh and Sri Lanka

Table 3 indicates that the mean Tax-to-GDP ratio of Bangladesh is mentionable lower than (4.60 or 58.15 per cent) Sri Lanka. The group statistics (Table 15) indicate that the contribution of Tax-to-GDP ratio of Bangladesh (M = 0.887, SD = 0.049) was lower than Sri Lanka (M = 1.094, SD = 0.050). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Sri Lanka.
H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Sri Lanka.

Table 15: Group Statistics

	Country Name	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	Sri Lanka	19	1.094448	0.0496174	0.0113830

Source: Analysis of data

The significance level of Levine's test (Table 16) is 0.767, which is greater than 0.05. Therefore, we should consider the first line of the output table in that situation, i.e. equal variances assumed. The result indicates no significant difference in tax revenue to GDP between Bangladesh and Sri Lanka.

Table 16: Independent Samples Test between Bangladesh and Sri Lanka

|		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
LogTax Revenue (% of GDP)	Equal variances assumed	.089	.767	-12.435	33	.000	-.2078315	-.0167137	-.2418358	-.1738271
	Equal variances not assumed			-12.453	32.164	.000	-.2078315	-.0166899	-.2418210	-.1738420

Source: Analysis of data

The t (33) statistic value is -12.435, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since p <0.05. The result indicates that the difference between the Tax-to-GDP ratios of two countries is statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and Sri Lanka are different.

6.3.2 Comparative scenario of Tax-to-GDP of Bangladesh and some groups of countries

Figure 2 and Table 4 testify that the Tax-GDP ratio of Bangladesh (mean 7.75) is mentionable lower than south Asian (10.31) and lower-middle-income countries (12.01) and far below than high income (15.67), OECD (15.73) and World (14.79) average. Though Bangladesh holds near position to the south Asian country average but is still far behind (about 2.5). The Tax-GDP ratio of high income and OECD country average is more than double compared to Bangladesh. The world average is approximately double that of Bangladesh.

Figure 2: Comparative Scenario of Tax-GDP Ratio among Different Group of Countries
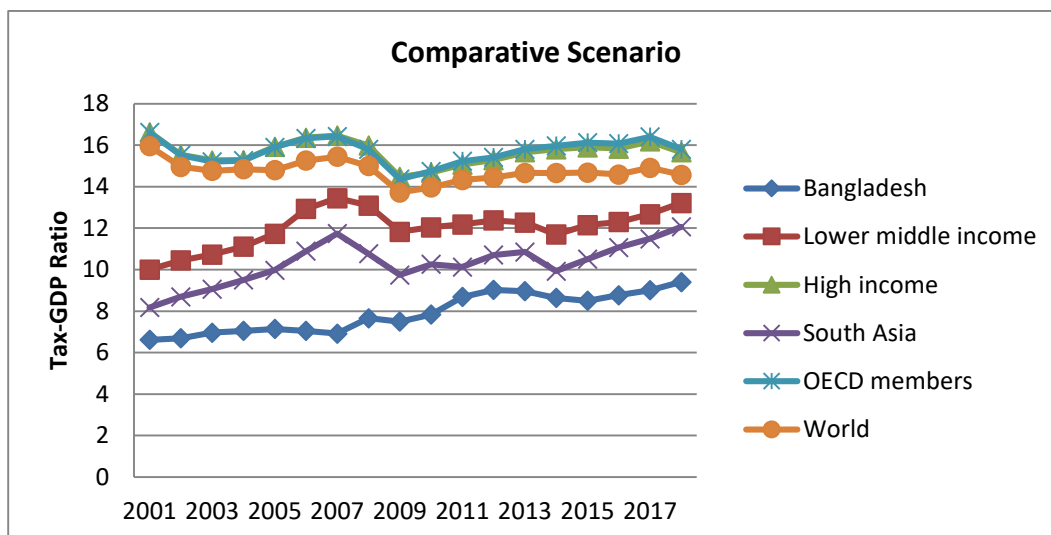
Source: Analysis of world development indicators' data of World Bank (filled up with trend value)

(i) Bangladesh and high income countries

Table 3 indicates that the mean Tax-to-GDP ratio of high income country average is about twice than Bangladesh. The group statistics (Table 17) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than high income countries (M = 1.195, SD = 0.016). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and High-Income Countries.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and High-Income Countries.

Table 17: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	High Income Countries	19	1.194861	0.0158844	0.0036441

Source: Analysis of data

The significance level of Levine's test (Table 18) is 0.000, which is smaller than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates a significant difference in tax revenue to GDP between Bangladesh and High-Income Countries.

Table 18: Independent Samples Test between Bangladesh and High-Income Countries

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Tax Revenue (% of GDP)	Equal variances assumed	33.249	.000	-25.997	33	.000	-.3082452	.0118571	-.3323685	-.2841218
	Equal variances not assumed			-24.199	17.676	.000	-.3082452	.0127381	-.3350422	-.2814482

Source: Analysis of data

The t (33) statistic value is -24.199, and the p-value is 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since p <0.05. The result indicates that the difference between the Tax-to-GDP of Bangladesh and high income countries are statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and high income countries are different.

(ii) Bangladesh and OECD member's countries

Table 3 indicates that the mean Tax-to-GDP ratio of OECD member country average is about twice than Bangladesh. The group statistics (Table 19) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than OECD member countries (M = 1.197, SD = 0.016). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and OECD Countries.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and OECD Countries.

Table 19: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	OECD Members	19	1.196520	0.0164167	0.0037662

Source: Analysis of data

The significance level of Levine's test (Table 20) is 0.0001, which is smaller than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates a significant difference in tax revenue to GDP between Bangladesh and OECD Countries.

The t (33) statistic value is -24.261, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since p <0.05. The result indicates that the difference between the Tax-to-GDP of Bangladesh and OECD member countries are statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and OECD member countries are different.

Table 20: Independent Samples Test between Bangladesh and OECD members Countries

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Tax Revenue (% of GDP)	Equal variances assumed	31.829	.000	-26.037	33	.000	-.3099034	.0119025	-.3341192	-.2856876
	Equal variances not assumed			-24.261	17.857	.000	-.3099034	.0127736	-.3367552	-.2830517

Source: Analysis of data

(iii) Bangladesh and South Asia

Table 3 indicates that the mean Tax-to-GDP ratio of south Asian country average is mentionable higher than (2.4 or 30.34 per cent) Bangladesh. The group statistics (Table

21) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than South Asian countries (M = 1.011, SD = 0.045). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and South Asia.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and South Asia.

Table 21: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	South Asia	18	1.011049	0.0446532	0.0105249

Source: Analysis of data

The significance level of Levine's test (Table 22) is 0.333, which is greater than 0.05. Therefore, we should consider the first line of the output table in that situation, i.e. equal variances assumed. The result indicates no significant difference in tax revenue to GDP between Bangladesh and South Asia.

Table 22: Independent Samples Test between Bangladesh and South Asia

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Tax Revenue (% of GDP)	Equal variances assumed	.967	.333	-7.762	32	.000	-.1244324	.0160300	-.1570845	-.0917803
	Equal variances not assumed			-7.721	30.648	.000	-.1244324	.0161169	-.1573183	-.0915466

Source: Analysis of data

The t (32) statistic value is -7.762, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since p <0.05. The result indicates that the difference between the Tax-to-GDP of Bangladesh and South Asian countries are statistically significant. The sample provides strong enough evidence that the

two population mean are not equal. Therefore, the population mean of Bangladesh and South Asian countries are different.

(iv) Bangladesh and lower middle income countries

Table 3 indicates that the mean Tax-to-GDP ratio of low middle income country average is mentionable higher than (4.10 or 51.83 per cent) Bangladesh. The group statistics (Table 23) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than Low Middle Income countries (M = 1.078, SD = 0.035). The following hypothesis is developed to test the result.

Table 23: Group Statistics

	Country Name	N	Mean	Std. Deviation	Std. Error Mean
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	Low Middle Income	18	1.078262	0.0354331	0.0083517

Source: Analysis of data

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and Lower Middle Income Countries.

H_1: There is a difference in mean Tax-to-GDP between Bangladesh and Lower Middle Income Countries.

Table 24: Independent Samples Test between Bangladesh and Low Middle Income Countries

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Lower	Upper
Tax Revenue (% of GDP)	Equal variances assumed	4.667	.038	-13.204	32	.000	-.1916463	.0145138		-.2212101	-.1620826
	Equal variances not assumed			-12.958	27.093	.000	-.1916463	.0147896		-.2219871	-.1613056

Source: Analysis of data

The significance level of Levine's test (Table 24) is 0.038, which is smaller than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates a significant difference in tax revenue to GDP between Bangladesh and Lower Middle Income Countries.

The value of the t (32) statistic is -12.958, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since $p < 0.05$. The result indicates that the difference between the Tax-to-GDP of Bangladesh and lower middle income countries are statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and lower middle income countries are different.

(v) Bangladesh and world

Table 3 indicates that the mean Tax-to-GDP ratio of world average is far above than (6.88 or 86.98 per cent) Bangladesh. The group statistics (Table 25) indicate that the contribution of Tax-to-GDP of Bangladesh (M = 0.887, SD = 0.049) was lower than world average (M = 1.170, SD = 0.015). The following hypothesis is developed to test the result.

H_0: There is no difference in mean Tax-to-GDP between Bangladesh and World.
H_1: There is a difference in mean Tax-to-GDP between Bangladesh and World.

Table 25: Group Statistics

	Country Name	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
LogTax Revenue (% of GDP)	Bangladesh	16	0.886616	0.0488231	0.0122058
	World	19	1.169602	0.0149997	0.0034412

Source: Analysis of data

The significance level of Levine's test (Table 26) is 0.0001, which is smaller than 0.05. Therefore, we should consider the second line of the output table in that situation, i.e. equal variances not assumed. The result indicates that there is a significant difference in tax revenue to GDP between Bangladesh and World average.

The value of the t (33) statistic is -22.315, and the p-value is displayed as 0.0001. Thus, the null hypothesis is formally rejected with 95% confidence since $p < 0.05$. The result indicates that the difference between the Tax-to-GDP of Bangladesh and World are statistically significant. The sample provides strong enough evidence that the two population mean are not equal. Therefore, the population mean of Bangladesh and World are different.

Table 26: Independent Samples Test between Bangladesh and World

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper	
Tax Revenue (% of GDP)	Equal variances assumed	35.854	.000	-24.013	33	.000	-.2829856	.0117845	-.3069613	-.2590100	
	Equal variances not assumed			-22.315	17.388	.000	-.2829856	.0126816	-.3096961	-.2562752	

Source: Analysis of data

7.0 Conclusion

The study investigated the comparative scenario of Tax-to-GDP contribution in Bangladesh with SAARC countries, south Asian countries average, OECD member countries average, and World average using secondary sources of data collected from world development indicators of World Bank. Descriptive statistics indicate that the mean Tax-to-GDP ratio of Bangladesh is increasing but lowest among SAARC countries, far below than OECD, high income, and world average.

The Shapiro-Wilk test is used because it is appropriate in the case of a small sample. The test results indicate that the actual data set is not normally distributed. So that it needed to log transformation and after log transformation the results showed an approximately normally distributed data set. As a parametric test an independent sample t-test is used in the study to find out the relationship of the Tax-to-GDP of Bangladesh with other countries and country groups. Independent sample t-test is used in the study because all six assumptions are met the data of the study. The test results implies that the population mean of Tax-to-GDP contribution Bangladesh are different from Bhutan, India, Maldives, Nepal, and Sri Lanka, but no difference between Bangladesh and Afghanistan among SAARC countries. Independent sample t-test results also implies that the population mean of Tax-to-GDP contribution Bangladesh are different from high income, OECD member, South Asian, Lower middle income countries and World average.

8.0 Acknowledgment

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