# A comparative study of the cultural, demographic, economic and educational factors affecting student-teacher ratios in the primary schools of Saudi Arabia with those in other countries

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## Abstract

Data from UNESCO on student-teacher ratio were analysed for 80 countries based on the availability of valid data the entire period of 2007-2015. Comparisons of Saudi Arabia with other countries was done using t-test for statistical significance. All differences, except four, were found to be statistically significant. Separate comparisons of Saudi Arabia and mean ratios for different income group countries and with individual high income group countries were also done. The observed differences were explained and interpreted in terms of factors likely to affect these ratios evidenced by published works. The possibility of a ratio which optimises both resource efficiency and effectiveness was identified and this could be a future research area.

**Keywords:** Student-Teacher Ratio, Factors, Primary School, Saudi Arabia, Middle East

## Introduction

Student-teacher ratio indicates the relationship between the number of students in the context and the number of full time equivalent of teachers in the context. Since the denominator is always 1, the ratio can be expressed in absolute numbers. Thus, a ratio of 10 means 10:1, 10 students per full time equivalent of teachers. The full time equivalent (FTE) is counted as: one full time teacher is 1, two part-time teachers is equivalent to one full time teacher. There is no categorisation within part-time, as accounting for the exact teaching hours and converting to full time equivalent complicates the issue. The context may be one school (all, primary, secondary, public or private), college, university, a district, state or country. It can be expanded to global regions, countries, funding, soci0- economic status, culture and other variables. Some of these points are discussed in (Edglossary, 2014).

## Methodology

The aim of this paper is to compare the student-teacher ratio in the primary schools of Saudi Arabia with some selected countries and relate the differences with cultural, demographic, economic and educational factors. This is a primary research in which the data collected from UNESCO database were utilised. Data for continuing years were obtained for Saudi Arabia only for the period of 2007-2015. A total of 125 other countries also had such data. However, valid data for analysis were obtained only for 80 countries, including Saudi Arabia. These data were used.

The pupil to teacher ratio data was obtained for the years 2007-2015 for 80 countries. The mean pupil to teacher ratio was calculated using the whole year data from 2007-2015 for each of the countries.

Summary statistics (e.g., mean) were calculated for each country and for the income groups associated with each country.

A one sample t-test is a suitable technique to test of the mean of a variable significantly differs from a specified mean (Katz, 2011), which is the mean pupil to teacher ratio for Saudi Arabia in this case. This technique was utilized to compare the mean pupil to teacher ratios of all countries in the sample with Saudi Arabia. A .05 level of significance was used as the criteria for statistical significance.

## Results

Results obtained by one sample t-test are given in Table 2. There were significant differences between the mean ratio for all countries and Saudi except for Austria, Brunei Darussalam, Latvia and Qatar. There was no abnormal patterns in the time series data for the various countries, which could vitiate the results.

Table 1: Average Pupil to Teacher Ratio - 2007 to 2015 and statistical significance of each country in comparison with Saudi Arabia.

| Country Name | Income Group | Minimum | Maximum | Mean | SD | t | df | Sig. |
|---|---|---|---|---|---|---|---|---|
| Algeria | Upper middle income | 23.00 | 23.93 | 23.36 | 0.3 | 117.245 | 7 | <.001 |
| Andorra | High income | 9.33 | 10.33 | 9.82 | 0.36 | -9.074 | 7 | <.001 |
| Austria | High income | 10.70 | 11.86 | 11.13 | 0.44 | 1.012 | 7 | .345 |
| Azerbaijan | Upper middle income | 11.04 | 12.62 | 11.61 | 0.57 | 3.156 | 7 | .016 |
| Belarus | Upper middle income | 14.91 | 16.48 | 15.39 | 0.56 | 22.435 | 7 | <.001 |
| Belgium | High income | 11.03 | 11.24 | 11.17 | 0.06 | 8.856 | 7 | <.001 |
| Belize | Upper middle income | 21.56 | 22.88 | 22.35 | 0.43 | 74.053 | 7 | <.001 |
| Brazil | Upper middle income | 20.52 | 23.86 | 21.96 | 1.16 | 26.801 | 7 | <.001 |
| Brunei Darussalam | High income | 10.15 | 12.67 | 11.36 | 0.98 | 1.112 | 7 | .303 |
| Bulgaria | Upper middle income | 15.94 | 17.73 | 17.13 | 0.71 | 24.589 | 7 | <.001 |
| Burkina Faso | Low income | 44.50 | 52.69 | 48.67 | 2.81 | 37.91 | 7 | <.001 |
| Cabo Verde | Lower middle income | 22.60 | 24.86 | 23.57 | 0.78 | 45.824 | 7 | <.001 |
| Cambodia | Lower middle income | 44.63 | 50.88 | 47.69 | 1.98 | 52.557 | 7 | <.001 |
| China | Upper middle income | 16.23 | 17.68 | 17 | 0.47 | 36.557 | 7 | <.001 |
| Colombia | Upper middle income | 24.29 | 29.52 | 27.28 | 2.19 | 21.045 | 7 | <.001 |
| Congo, Dem. Rep. | Low income | 34.75 | 39.02 | 37.02 | 1.41 | 52.28 | 7 | <.001 |
| Cuba | Upper middle income | 9.06 | 9.65 | 9.26 | 0.26 | -18.733 | 7 | <.001 |
| Cyprus | High income | 13.39 | 15.63 | 14.07 | 0.77 | 11.331 | 7 | <.001 |
| Dominica | Upper middle income | 14.25 | 17.32 | 15.88 | 0.97 | 14.242 | 7 | <.001 |
| Dominican Republic | Upper middle income | 19.62 | 25.53 | 23.42 | 2.22 | 15.842 | 7 | <.001 |
| Eritrea | Low income | 37.96 | 47.87 | 42.1 | 3.41 | 25.846 | 7 | <.001 |
| Finland | High income | 13.20 | 15.03 | 13.86 | 0.61 | 13.446 | 7 | <.001 |
| Germany | High income | 11.58 | 13.63 | 12.53 | 0.8 | 5.491 | 7 | .001 |
| Guatemala | Lower middle income | 22.98 | 30.45 | 26.65 | 2.61 | 16.997 | 7 | <.001 |
| Guinea | Low income | 42.19 | 45.59 | 44.1 | 1.07 | 87.844 | 7 | <.001 |
| Hong Kong SAR, China | High income | 13.85 | 16.94 | 15.2 | 1.15 | 10.372 | 7 | <.001 |
| Hungary | High income | 10.06 | 11.24 | 10.53 | 0.33 | -3.788 | 7 | .007 |
| Indonesia | Lower middle income | 16.09 | 20.69 | 18.56 | 1.54 | 13.973 | 7 | <.001 |
| Japan | High income | 16.45 | 18.49 | 17.55 | 0.74 | 25.178 | 7 | <.001 |

| Country Name | Income Group | Minimum | Maximum | Mean | SD | t | df | Sig. |
|---|---|---|---|---|---|---|---|---|
| Kazakhstan | Upper middle income | 16.19 | 16.86 | 16.46 | 0.21 | 72.258 | 7 | <.001 |
| Korea, Rep. | High income | 16.50 | 25.59 | 20.41 | 3.39 | 7.865 | 7 | <.001 |
| Kuwait | High income | 8.38 | 9.61 | 8.79 | 0.4 | -15.546 | 7 | <.001 |
| Kyrgyz Republic | Lower middle income | 23.90 | 25.31 | 24.43 | 0.47 | 80.28 | 7 | <.001 |
| Lao PDR | Lower middle income | 25.16 | 30.49 | 27.91 | 2.03 | 23.651 | 7 | <.001 |
| Latvia | High income | 10.45 | 11.88 | 11.15 | 0.4 | 1.227 | 7 | .26 |
| Lebanon | Upper middle income | 12.05 | 14.34 | 13.69 | 0.94 | 8.208 | 7 | <.001 |
| Lesotho | Lower middle income | 32.63 | 37.20 | 34.14 | 1.45 | 45.263 | 7 | <.001 |
| Lithuania | High income | 12.41 | 13.26 | 12.77 | 0.29 | 17.837 | 7 | <.001 |
| Macao SAR, China | High income | 13.70 | 20.35 | 16.04 | 2.43 | 5.909 | 7 | .001 |
| Madagascar | Low income | 39.77 | 48.73 | 43.97 | 3.53 | 26.465 | 7 | <.001 |
| Malawi | Low income | 69.15 | 80.68 | 76.06 | 3.86 | 47.702 | 7 | <.001 |
| Malaysia | Upper middle income | 11.41 | 14.98 | 12.84 | 1.27 | 4.16 | 7 | .004 |
| Maldives | Upper middle income | 11.19 | 14.52 | 12.38 | 1.09 | 3.648 | 7 | .008 |
| Mauritania | Lower middle income | 34.38 | 42.51 | 38.14 | 2.64 | 29.087 | 7 | <.001 |
| Mauritius | Upper middle income | 18.73 | 21.66 | 20.76 | 1.06 | 26.167 | 7 | <.001 |
| Mexico | Upper middle income | 27.41 | 28.15 | 27.94 | 0.26 | 186.561 | 7 | <.001 |
| Moldova | Lower middle income | 15.32 | 16.81 | 15.94 | 0.5 | 28.244 | 7 | <.001 |
| Mongolia | Lower middle income | 27.21 | 31.60 | 29.53 | 1.6 | 32.854 | 7 | <.001 |
| Morocco | Lower middle income | 25.67 | 27.38 | 26.33 | 0.54 | 80.256 | 7 | <.001 |
| Mozambique | Low income | 54.83 | 64.80 | 58.57 | 4.25 | 31.645 | 7 | <.001 |
| Nepal | Low income | 23.93 | 40.02 | 31.22 | 5.68 | 10.076 | 7 | <.001 |
| Niger | Low income | 35.75 | 40.72 | 38.46 | 1.65 | 47.129 | 7 | <.001 |
| Pakistan | Lower middle income | 39.69 | 46.52 | 41.38 | 2.28 | 37.67 | 7 | <.001 |
| Panama | Upper middle income | 21.99 | 24.54 | 23.23 | 0.9 | 38.459 | 7 | <.001 |
| Peru | Upper middle income | 17.66 | 21.79 | 19.63 | 1.36 | 17.976 | 7 | <.001 |
| Poland | High income | 9.32 | 10.64 | 10.03 | 0.41 | -6.493 | 7 | <.001 |
| Portugal | High income | 10.83 | 13.41 | 11.76 | 0.89 | 2.508 | 7 | .041 |
| Qatar | High income | 9.60 | 12.50 | 11.12 | 0.95 | 0.442 | 7 | .672 |
| Rwanda | Low income | 58.09 | 69.29 | 63.17 | 4.83 | 30.598 | 7 | <.001 |
| Saudi Arabia | High income | 10.54 | 11.43 | 10.97 | 0.29 | - | - | - |
| Senegal | Low income | 31.59 | 36.44 | 33.43 | 1.66 | 38.262 | 7 | <.001 |
| Serbia | Upper middle income | 15.16 | 17.04 | 16.02 | 0.63 | 22.641 | 7 | <.001 |
| Seychelles | High income | 12.47 | 13.82 | 13.02 | 0.47 | 12.343 | 7 | <.001 |
| Slovak Republic | High income | 14.94 | 16.61 | 15.4 | 0.54 | 23.051 | 7 | <.001 |
| South Africa | Upper middle income | 32.03 | 33.60 | 32.92 | 0.53 | 117.384 | 7 | <.001 |
| Spain | High income | 12.40 | 13.32 | 12.71 | 0.34 | 14.313 | 7 | <.001 |
| Sri Lanka | Lower middle income | 23.15 | 24.43 | 23.78 | 0.38 | 95.078 | 7 | <.001 |
| St. Kitts and Nevis | High income | 13.06 | 16.59 | 14.7 | 1.19 | 8.89 | 7 | <.001 |
| St. Lucia | Upper middle income | 14.22 | 22.73 | 18.55 | 2.74 | 7.825 | 7 | <.001 |
| Suriname | Upper middle income | 13.23 | 15.99 | 14.37 | 0.98 | 9.787 | 7 | <.001 |
| Tajikistan | Lower middle income | 21.61 | 25.18 | 23.01 | 1.03 | 33.02 | 7 | <.001 |
| Togo | Low income | 39.14 | 43.51 | 41.17 | 1.21 | 70.436 | 7 | <.001 |
| Tonga | Upper middle income | 21.11 | 25.75 | 24.1 | 1.7 | 21.862 | 7 | <.001 |
| Tunisia | Lower middle income | 16.54 | 18.15 | 17.25 | 0.46 | 38.912 | 7 | <.001 |

| Country Name | Income Group | Minimum | Maximum | Mean | SD | t | df | Sig. |
|---|---|---|---|---|---|---|---|---|
| Ukraine | Lower middle income | 15.58 | 16.89 | 16.09 | 0.46 | 31.786 | 7 | <.001 |
| United Kingdom | High income | 17.24 | 18.44 | 17.8 | 0.5 | 38.627 | 7 | <.001 |
| United States | High income | 13.59 | 14.54 | 14.08 | 0.38 | 22.995 | 7 | <.001 |
| Uzbekistan | Lower middle income | 14.97 | 18.24 | 16.89 | 1.28 | 13.051 | 7 | <.001 |
| Vietnam | Lower middle income | 18.88 | 20.44 | 19.61 | 0.48 | 51.045 | 7 | <.001 |
| West Bank and Gaza | Lower middle income | 23.59 | 30.08 | 26.53 | 2.51 | 17.569 | 7 | <.001 |

The mean student-teacher ratio for Saudi Arabia, over the period of 2007-2015, was 10.97. Andorra, Cuba, Hungary, Kuwait and Poland were the only countries with ratios lower than that of Saudi Arabia and the differences were significant. Kuwait had the lowest mean ratio of 8.79. Malawi had the highest mean ratio of 76.06.

The data were classified into income groups of nations as given by UNESCO database. The descriptive statistics of this analysis are presented in Table 2.

Table 2: Average Pupil to Teacher Ratio - 2007 to 2015 by Country Income Group

| Income Group | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Low income | 12 | 31.22 | 76.06 | 46.50 | 13.22 |
| Lower middle income | 19 | 15.94 | 47.69 | 26.18 | 8.86 |
| Upper middle income | 24 | 9.26 | 32.92 | 19.06 | 5.80 |
| High income | 25 | 8.79 | 20.41 | 13.12 | 2.81 |
| Saudi Arabia | High income | 10.54 | 11.43 | 10.97 | 0.29 |

Interestingly sample size increased with increasing income status of countries. It may be related to better reporting from the higher income category of countries for all the years of the study period. Minimum, maximum and mean and Standard deviations of ratios decreased with increasing national income levels. It cannot be said whether there was any sample size effect on the values. The mean value of Saudi Arabia places it in the high income group as per the UNESCO standards.

**Income comparisons**

Table 3 gives the mean student-teacher ratios of other high income group countries. Out of 25 high income countries in the sample, four countries, Andorra, Hungary, Kuwait and Poland, had lower ratios than that of Saudi Arabia and all of them significantly from Saudi Arabia.

Only Poland had a lower mean ratio than that of Saudi Arabia. Higher income need not always mean lower student-teacher ratio if countries within the same group are considered.

All the four countries which were not significantly different from Saudi Arabia were high income group countries and their ratios were numerically higher than that of Saudi Arabia.

Table 3: Comparison of mean student-teacher ratio of Saudi Arabia with the means of other high income group countries

| Country | Mean Student-Teacher Ratio |
|---|---|
| Andorra | 9.82 |
| Austria | 11.13 |
| Belgium | 11.17 |
| Brunei Darussalam | 11.36 |
| Cyprus | 14.07 |
| Finland | 13.86 |
| Germany | 12.53 |
| Hong Kong SAR, China | 15.20 |
| Hungary | 10.53 |
| Japan | 17.55 |
| Korea, Republic | 20.41 |
| Kuwait | 8.79 |
| Latvia | 11.15 |
| Lithuania | 12.77 |
| Macao SAR, China | 16.04 |
| Poland | 10.03 |
| Portugal | 11.76 |
| Qatar | 11.12 |
| Saudi Arabia | 10.97 |
| Seychelles | 13.02 |
| Slovak Republic | 15.40 |
| Spain | 12.71 |
| St. Kitts and Nevis | 14.70 |
| United Kingdom | 17.80 |
| U S A | 14.08 |

## Discussion

The aim of the paper was to examine whether cultural, demographic, economic and educational factors explain the differences between Saudi Arabia. The findings of this study are explained and interpreted with the support of published literature.

### Country differences

The difference in the student-teacher ratios of Saudi Arabia and other countries could be due to differences in one or more of economic, cultural or educational status. Saudi Arabia is a high income (high GDP), Islamic and educationally advanced country. It had a deficit budget in 2017. The mean annual population growth is about 1.5% and the population of school and college going age (0-24 years) dominating (about 45%- 2017 estimate) in its demography. Among the high income countries, only Kuwait and Qatar are Islamic countries from the same region. Kuwait has only 40% of its population in the school and college going age groups. It has an

annual population growth rate of about 1.5%. Usually a budget surplus state, in 2015, it experienced the first budget deficit condition. As a wealthy country, it compares well with Saudi Arabia. Qatar is an Islamic country with only 25% of its population in school and college going age, but with a higher annual population growth rate of 2.3%. The per capita GDP is the second highest in the world as per 2017 estimate. The economic status is slightly lower than that of Saudi Arabia for most other economic indicators. Thus, all these countries are more or less at the same levels of economy, culture, demography and education (CIA, 2018). However, Kuwait had a student-teacher ratio of 8.79, the lowest among all countries. Qatar and Saudi Arabia have similar ratios. The ratio could lower either due to decreasing student enrolment or due to increasing teacher numbers. When the population increases at the rate of 1.5%, of which about 40% are in the educational age groups, students' enrolment should only increase. A more than proportional increasing number of teachers with increasing student enrolment beyond the state standards of student-teacher ratios is possible. Generally, the ratios are lower in private schools. There are a large number of private schools in Kuwait run by international agencies.

Such country comparisons have given inconsistent results, unexplainable due to lack of data. In an examination of Third International Mathematics and Science Study (TIMSS) data on 11 countries, increasing performance in mathematics with increasing class size (maximum 50) was noted in the case of Singapore, but not in Iceland was noted by Wößmann and West (2006).

A traditionally important variable for the internal efficiency of schooling as argued by educators is class size or the pupil: teacher ratio within the range 25 to 45 students. The larger the class size or higher the pupil: teacher ratio, the lower the student achievement. Four studies, including both IEA studies in Chile, Thailand and elsewhere found this assertion to be incorrect. However, in Puerto Rico, Malaysia, and the Congo, a larger class size did in fact have a negative impact on performance. These countries were not in the IEA sample studied by the authors (Simmons & Alexander, 1978).

With increasing student-teacher ratios, the economic growth decreased in a study of the data on 98 countries by Barro (1991) for the period of 1960-1985. Lower quality of education leading to poor quality of human capital was pointed out.

This study did not analyse the factors related to student-teacher ratios or their effects on performance outcomes. Some of these factors and effects are discussed below.

**Educational contexts**

All qualitative and quantitative results reflecting teacher and student instructional variables favoured lower student-teacher ratios in a primary level special school environment. The ratios were varied from 1, 3, 6, 9 and 12. These results were reported by Thurlow, Ysseldyke, Wotruba, and Algozzine (1993).

In the case of Massive Open Online Courses, diverse students of different ages from almost all countries join various courses. In an investigation of navigation strategies of 140546 students, Guo and Reinecke (2014) found that the certificate earners skipped about 22% of the content and employed non-linear navigation frequently by jumping to previous lectures. The results also showed that older students and those from countries with lower student-teacher ratios like USA and European countries visited and repeated more lecture sequences, indicating more non-linear navigation and learning strategies. Younger students and those from countries with higher student-teacher ratios like India and Kenya visited and repeated fewer sequences, indicating

more linear navigation. The effect of age was stronger than that of the country. Older students from both types of countries navigated more or less similarly and so was the case with younger students.

Based on their economic analysis, Deal, Li, and Zhao (2014) noted increase in student-teacher ratio with increasing teacher experience in Oregon district schools. As the teacher experience varied between eight and 10 years, student-teacher ratio increased from 13 to 25.5. The district year budget was correlated with teacher experience.

In a US study of Eppig, Fincher, and Thornhill (2011) comparing various levels of parasitic stress of infectious diseases on different variables, average IQ was negatively correlated with student-teacher ratios. Conditional support for higher student-teacher ratios producing adults with reduced risk of incarceration was obtained (Arum & LaFree, 2008) in a school-wise study of data obtained in National Longitudinal Study of Youth (NLSY) in USA. States spending more on reducing student-teacher ratios were also spending more on social welfare programmes.

Student-teacher ratios along with many other important data of each school in Washington and Washington City in general were prepared by Muchnick (2010) for Barack Obama. Had the data been consolidated and tabulated for the association of different variables with student-teacher ratios, it would have helped to understand the effect of many economic social, cultural and educational factors on student-teacher ratios.

**Educational funding, resources, reforms**

Hanushek (1996) focused on direct policy implementations on school spending issues. In USA, inflation-adjusted expenditure per student has been increasing over the years in line with the political policies. The increases have happened from three sources. Declining student-teacher ratios and increases in real salaries of teachers affect direct instructional staff expenditures. The reasons for decrease in student-teacher ratios have been: deliberate programmes to reduce class sizes and introduction of new supplementary programmes to increase individual attention. The student-teacher ratio declined from 25.6 in 1960-61 to 17.3 1990-91 steadily. There are some indications about declining quality of education from SAT scores, but the results of National Assessment of Educational Progress (NAEP) in reading, mathematics and science show almost constant performance. Some comparisons also showed that US students were below par with students from certain other countries. Certain parameters of equity have shown erratic trends in comparisons of race or socio-economic status. Key resources of education were identified as student-teacher ratio and educational level, experience and salaries of teachers, expenditure per student, administrative inputs and facilities. Out of 377 studies, only 15% were significantly positive and 27% were non-significantly positive. It may not be possible to consider non-significant results even if positive. The reasons given by the author for declining student-teacher ratio over the years could be applicable to at least some countries in this study. However, lack of data do not allow comparison Saudi Arabia and other countries for these reasons. Student-teacher ratio becomes an economic resource when the expenditures are considered. Here too, comparable data are not available.

In their studies, Ostroff and Schmitt (1993) noted that a high student-teacher ratio may be more resource-efficient as fewer employees and resources are required to achieve the aims. However, a lower ratio is desirable to improve the learning environment, student achievement and thus improve effectiveness. The authors distinguish efficiency and effectiveness in discussing these points. Efficiency denotes an input-output ratio or comparison. Effectiveness means the actual

achievement of output or acquisition on input. If this is applied to this study, Saudi Arabia is less resource efficient, but more effective on learning outcomes and many other countries which have low ratios are similarly placed. There should be a ratio which optimises both resource-efficiency and effectiveness. Alternatively, countries can choose what they want and prescribe standards accordingly. An interesting classification may be setting a cut-off point of say 25 as the optimal level and classify the countries accordingly, some interesting results are obtained. No country is above 25 in the case of the 25 high income group countries. Three out of 24 upper middle income, eight out of lower middle income and all 12 of the low income countries had their student-teacher ratios above 25. If the argument of Ostroff and Schmitt (1993) is correct, as the income level of countries increases, the decreasing effect on student-teacher ratio increases effectiveness at the cost of resource efficiency. But this effect does not seem to be logical as other factors also contribute.

One of the intervening effect is parental efforts. In their findings, Houtenville and Conway (2008) reported a greater effect of parental efforts than the effect of school resources such as student-teacher ratios on student achievements, indicating crowding out of the effect of school resources by parental efforts. It is more likely that literate parents show greater interest about studies of their children. In that case, the literacy rate of the country may affect student performance irrespective of the ratio. To verify this, the correlation between the literacy rates of parents and student-teacher ratio of the country need to estimated.

In an investigation in which student-teacher ratio was one of the variables to study the recent educational reforms in Tanzania, Vavrus (2009) noted the need for considering cultural, economic, and political dimensions of teachers' practice when evaluating the reform efforts. Contingent constructivism was proposed as an alternative to the internationally accepted single model for excellence in teaching. These dimensions also affect resource efficiency and effectiveness.

The complexity of the problem has been well explained by (Hanushek, 2008). He updated on the observations of his earlier paper (discussed above) that the commonly bought inputs like class size (student-teacher ratio), teacher education or teacher experience were unable to produce consistent improvement in student performance. Teacher quality has been shown to improve effectiveness in terms of student performance, but not necessarily through salaries or other identifiable variables of teachers. It is not clear, to what extent teacher quality can moderate the effect of student-teacher ratio.

**Cultural differences and countries**

Pointing out that American parents were likely to select schools with lower student-teacher ratios in the range of 12 and below, Tobin, Wu, and Davidson (1987) asked the logic of Japan, a rich and educationally better country outdoing most other countries continuing with its ratio of 30 for preschool level. Cultural differences were given as the reason for this difference. According to Hofstede (2018), both countries have similar low power distance. Japan is high on masculinity, uncertainty avoidance, long term orientation. Individualism and indulgence are higher for USA. The differing patterns of rations found by the authors could be a reflection of these differences. There are not many studies on how exactly these cultural factors affect numerical values of the ratio. In this study also, the ratio for USA was 14.06 and for Japan 17.55. The difference could be significant.

Low level of performance by English Language Learning students in public schools with low standardised test scores are due to high student-teacher ratios among many factors. This was observed in a US study by Fry (2008). However, in countries where English is learned as a second or as a foreign language, the enrolment level could be low due to the lower number of needy students. In such cases also, the students-teacher ratio may be low. However, even such special types of language studies do not achieve the required level of competence. One reason may be the cultural difference between English native and these English non-native countries. So, this US observation may not be extendable to developing countries, where the ELL requirement is large. Saudi Arabia is an EFL country with a ratio (10.97) lower than that of USA (14.08).

In a report on Puerto Rican study, Therriault, Li, Bhatt, and Narlock (2017), student–teacher ratios were lower with higher graduation rates for male, poor and special education students after other school characteristics were controlled. Such effects of demographic and socio-economic status are also possible when resource efficiency and effectiveness and an optimum ratio are sought.

Sometimes, the low student-teacher ratios could be due to causes other than low enrolment or high teacher turnover rate. In post-Soviet era East European countries, demographic shifts, including significant emigration and reductions in birth rate contributed to much lower student-teacher ratios of 9 or 10 in Latvia, Georgia and Estonia compared to 14 in OECD countries and the school performances were above average as per OECD standard (Smith & Persson, 2016). Large scale immigrations in Saudi Arabia is a possible factor. In this study, the ratio for Latvia was 11.15. The explanation for low ratio of Latvia given by the authors seems reasonable. The ratios of the other two countries could not be included.

**School/class environment**

According to Mitchell, Bradshaw, and Leaf (2010), student-teacher ratio was negatively related to overall school climate and unrelated with student academic performance. Lehman (2003) found that in Western and Central Africa, most out of school children live in rural areas. The potential student population is insufficient for schools with three to six teachers. Students' need to walk from neighbouring villages to their schools also contribute to low enrolment. Teachers handle only one or two grades in classrooms at a time. The overall effect of all these is low student-teacher ratio. Such low ratios are not the result of deliberate strategies to reduce the ratio for increasing effectiveness. They are the results of forced circumstances. Therefore, in such countries, low student-teacher ratios do not lead to higher student performance as had been the case with western countries. If countries have a large percentage of rural areas, that could be a reason for lower ratios. According to (CIA, 2018), 83.5% population is urban and annual urbanisation rate is1.5%. So, the rural population factor is not relevant to Saudi Arabia. To compare, South Korea (ratio 20.41) has about 83% urbanisation, but consists of 70% mountainous areas. The accessibility factor also might have been a factor for the higher ratio that that of Saudi Arabia. Malawi was a low income country, which recorded the highest ratio of 76.06. It has only about 16.6% urbanisation. High percentage of rural character could be a factor for such a high ratio of Malawi (all data from (CIA, 2018)).

Varying class size in terms of 7-13, 14-16 and 17 plus students per teacher in a Student Achievement Guarantee in Education (SAGE) programme were used in a quasi-experimental study in Wisconsin, California and Texas. However, this has not led to radical and instant change

to student-centred teaching. But attention at individual levels improved, helped the teachers to know their students better, getting more time for instruction due to reduction in classroom misbehaviour and thus leads to more satisfaction and pleasure of teaching for the teachers. The results were observed irrespective of school year, grade or type of classroom (Zahorik, 1999). These results were consistent with the results obtained in the Tennessee Star experiment reported by Molnar, et al (1999). Just because student-teacher ratio is lower or higher, student performance need not improve. Other factors like teaching quality (discussed above) and parent involvement are also important.

In the correlations obtained by Gottfredson and DiPietro (2011), student-teacher ratios were positively associated with urban migration and some other variables. Data from the US National Study of Delinquency Prevention in Schools were used. How urban migration increases the ratio is difficult to understand, urbanisation was found to be associated with lower rations as was discussed above. In North Carolina, significant correlations for teachers' working conditions and student-teacher ratios in the case of middle and high school performances were noted in a study by Church (2009). About 82% of variations were explained by middle school performance alone.

A study by Chamberlain, Morris, and Wooster (2015) measured student achievement as percentage of students meeting or exceeding the state standards of proficiency in mathematics and reading on $5^{th}$ to $8^{th}$ grade students in Oregon district. The effect of different educational inputs on these proficiencies were assessed. The results showed that increased expenditure per-student, longer school years, smaller student-teacher ratios and larger district enrolment correlated with a higher percentage of achievers in reading proficiency, but not in mathematics. The benefits of marginal changes in educational inputs were greater in urban districts than rural districts. Also, the benefits were greater for economically disadvantaged (ECD) students than non-ECD students in this respect. There was a type of community effect in the negative impact of increasing ECD student enrolment on ECD student performance. The expenditure on education as % of GDP were: 5% for Saudi Arabia in 2008, 3.9% for Kuwait and 3.5% in Qatar in 2014. Different years of reference makes it difficult to compare the three Islamic countries from the Middle East. In this study, the ratio was 8.79, the lowest of all countries, for Kuwait compared to about 11 for Saudi Arabia and Qatar. Thus, there is no relationship of educational expenditure with the ratio.

**Race/Ethnicity**

Teacher ratings of positive relationships and behaviours of students were positively associated with non-white race/ethnicity, shorter length programmes, programmes within the school setting and better student-teacher ratios according to the findings of Mashburn, Hamre, Downer, and Pianta (2006). Thus teacher quality is influenced by the ratio. The meaning of better student-teacher ratio is not clear. More students would like to go to teachers whose quality of teaching is good and this will raise the ratio. But if the state or the school has some standards, the number of students under him may be regulated to the allowed ratio. Large percentage of immigrants in Saudi Arabia and other Gulf countries as well as a few other countries in the high income/upper middle income countries cause racial/ethnic diversity and this may be associated with the ratio. Foreign educational institutions would like to follow their home country culture. This will have an effect on the ratio also.

In Louisiana, desegregation of blacks into the normal school increased the cost per student by 42% leading to a 15% improvement in their high school graduation. The estimated present value of the additional education exceeded the additional cost. There were large reductions in student-teacher ratios as the quality gap narrowed between black-white schools and all-white schools and there were smaller increases in exposure of blacks to whites in the districts with higher black enrolment rates. In 1960, as the black enrolment share increased from 0.1 to 0.75, the black-white student-teacher ratio gap increased from about 2 to 7. In 1970-72, the same student-teacher ratio gap became almost zero for the same samples due to intense strategies for desegregation. Change in black student-teacher ratios decreased with increasing levels of black enrolment. The authors had not been able to explain well how the student-teacher ratio decreased after additional enrolment of blacks in white schools, unless teacher population decreased more than proportionately during the period. The data on the number of teachers has not been given in this paper by Reber (2010). In countries, where there are significant racial/ethnic diversities, non-discrimination could lead to an optimum ratio for resource efficiency and effectiveness.

**Class size and teacher turnover rates**

According to Loeb, Darling-Hammond, and Luczak (2005), high rates of teacher turnover in Californian schools were associated with large class sizes (high student-teacher ratios) and lack of physical facilities apart from teacher salaries among other variables. The class sizes varied from less than 25 to more than 33. How a difference of eight students in a class can increase teacher turnover rate is difficult to understand, unless the difference between lower than 25 and higher than 33 is very wide. The ratios reported in this study are higher than the ratio of any high income group country. How California has such a high ratio is not clear.

In an Indian study, Muralidharan, Das, Holla, and Mohpal (2017) observed that the high absence rate of public school teachers in rural India (23.6%) could be reduced by close monitoring. Investing in reducing teacher absence by better monitoring was cost effective ten times more than recruit more teachers to reduce student-teacher ratios. Student-teacher ratio for the entire country decreased from 47.19 in 2003 to 39.8 in 2010. Obviously, effective number of teachers in the job on any day will be improved if their absence is controlled. This will decrease the ratio. Even at 39.8, the ratio is high for efficiency although resource efficiency night be good.

The effects of class size reduction can be achieved even better and more economically by introducing by introducing Teacher Advancement Programmes (TAP), noted Hudson (2010). This is a performance-based pay system for teachers, especially in mathematics, if not in all subjects. Teacher advancement programmes improve teaching quality, the effect of which on the ratio was discussed above.

# Conclusions

Saudi Arabian student-teacher ratio compares well and even better than some of the economically advanced countries. Comparisons by income groups of countries and between Saudi Arabia and other high income group countries yielded useful findings. Factors likely to explain the differences between Saudi Arabia and other countries were examined using published literature. There could be a student-teacher ratio which optimises both resource efficiency and effectiveness. Research on this aspect is recommended.

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