

Explore Inter-Relationship between Tax Revenue and Education Index of Select Countries

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Abstract

The education level in any country is a key indicator of overall development, both in developing and developed countries. The study's objective is to explore the inter-relationship between tax revenue and the education index of select countries. For the present study, five countries, France, Italy, Brazil, Canada, and India, have been selected. For data analysis, correlation and regression have been calculated. For testing hypothesis, t-test has been administered. Results of correlation show that Canada's tax revenue and education index are highly correlated compared to the other countries. The study developed the prediction model of the education index for select countries. In all five countries, the results of the t-test show that the regression prediction model has been significant, and the difference between the actual education index and the predicted education index is not significant; this indicates that the model developed by us is significant. It can be applied anywhere in the real world. The prediction model can be used to identify a particular target of education and to determine the amount of tax revenue that will be required to enhance the education level in a particular country.

Keywords: Education Index, Tax Revenue, Relationship, Five Countries, Prediction Model

Introduction

In today's developing era, education is the most crucial indicator of a particular country's social and economic development. The high quality of society's education can be used as an indicator of the success of the educational programmes; the development of a social and economic

programme can indirectly increase the education system of a particular country. The education level of any country's people depends on government expenditure and awareness programmes. The government of any country looks after the welfare of its individuals through tax revenue. So, there is a relationship that exists between tax revenue and education index. Generally, it is an assumption that there is a correlation between tax revenue and education indicators. People agree that as soon as tax revenue is increased, the country's educational level is also increased, because if the government collects a high revenue through the taxes, it will spend the money on education of the society. Now, we need to check whether there is any significant relationship between the variables, i.e., tax revenue and education index. In this study, we aim to check if inter-relationship exists between tax revenue and the education index of select countries.

Literature review has been discussed and designed according to the objectives of the present research work.

Liu et al. (2017) explore the causality between education and health. Results revealed that in developing and underdeveloping countries, the short-run causality between education and health is unidirectional, whereas the long-run causality is bidirectional. In the developed countries, the causality is bidirectional in both the short- and long-run. Solihin et al. (2017) studied and analysed the efficiency and effectiveness of local government expenditure on the education sector, household spending on education, and regional GDP per capita in districts and cities of East Java, during the periods 2007-2014. The DEA (Data Envelopment Analysis) technique was used for measuring efficiency of government expenditure. Results found that the government Expenditure for Education (PPP) has no significant impact on the educational index, while household expenditure for education and GDP per

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capita has a positive significant impact on the education index. Koochi et al. (2017) estimate the integrated mean of Quality of Life (QOL) of the general population of different countries around the world and compare them on the grounds of the Human Development Index (HDI). Ten years' data were analysed with the Random Effect Model, using Stata 11 software. They also compare the QOL of different HDI subgroups. HDI can be used as a predictor of QOL. Thus, efforts must be aimed at promoting the HDI determinants. Lawal and Abdulkadir (2016) examined the level of government spending on the educational sector, and the consequential effect on the GDP. They have used trend analysis and simple linear regression between 1999 and 2007. Results showed that such spending does not follow a regular pattern and that the contribution of the educational sector to the GDP has a direct relationship with government funding to the sector. Ofoegbu et al. (2016) studied the impact of the total tax revenue on economic development using the Human Development Index of Nigeria, and also investigated if there was any difference in using Human Development Index and Gross Domestic Product in determining the relationship. The result shows that tax revenue has a significant and positive effect on HDI. This study's result also advocates that GDP is a measure of economic growth. Carvalho et al. (2016) studied the impact of macro-level institutional and infrastructure reforms on the economic, educational, and health dimensions of human well-being, among 25 transition economies. They showed that institutional and economic reforms led to positive economic effects and significant impacts on other dimensions of human development. Korkmaz & Kulunk (2016) examined the relationship between higher education, life expectancy at birth, and economic growth. They have used ten OECD countries' data from 2007 to 2010; unit root test, Granger Causality Test, and Panel Cointegration test were applied. Findings show a unidirectional causality from economic growth to the schooling rate, as well as from economic growth to life expectancy at birth. Banerjee (2016) examined the association between economic growth (GDP) and HDI (quality of life), i.e., health, education, and the standard of living. Results found that there is a strong correlation between macro-economic development parameters like health, education, GDP growth rate, and Quality of Life Index, expressed through HDI. Rahim and Rizak (2016) investigated the impact of direct buying on budget revenue, expenditure on education, health, economics, and human development index. They applied multiple regression model and the F test for the period

2004-2010. Results of the F test showed that variables of buying direct in education, health, and economic sectors have found a significant effect on the human development index. Gorka (2015) focused on the relevance citation for the economic indicators (GDP, Gross National Income, Inflation, Unemployment, and Per Capita Income) with that of social indicators (Literacy Rate, Poverty Rate, Health Index, and Education Index). Results showed that economic activities and social development levels are interrelated with each other in such a way that if one increases, the other will also witness an equivalent increase.

Research Methodology

Objective

To explore the inter-relationship between tax revenue and education index of select countries.

Hypothesis

There is no inter-relationship between tax revenue and education index of select countries.

Data Collection

In order to achieve the objective of the present research work, data have been collected through secondary sources. Data of education index was collected from UNDP (United Nations Development Programme) reports. Data on tax revenue of select countries (France, Italy, Brazil, Canada, and India) was collected from www.stats.oecd.org, International Monetary Fund (IMF), and ACE Knowledge Portal (ACEKP).

Sample Size

In order to determine sample size for the present research work, the GDP of 195 countries have been examined. Determination test was used. The result of this test shows a value of five; therefore, five sample countries, from the 195 countries whose GDP data was examined, was selected. After analysing the size of GDP in terms of value, it is found that France, Italy, Brazil, and Canada have more or less equal GDP to India. These countries' percentage share in total world GDP is as follows: France

(3.31%), Italy (2.49%), Brazil (2.42%), Canada (2.12%), and India (2.86%). Therefore, these five countries, France, Italy, Brazil, Canada, and India, have been selected as a sample for the present research work. The reason for the selection is that the GDP value of the four countries is nearly the same as India’s GDP value. GDP data of the 195 countries was retrieved from the World Development Indicators Database Report, World Bank.

Period of the Study

The data of the education index was retrieved from the UNDP (United Nations Development Programme) website. For this study, data for the period 2013-2018 is considered.

Statistical Tools and Techniques

In order to achieve the objective of the present research work, which explores the inter-relationship between tax revenue and education index of select countries,

correlation has been administered. For testing the hypothesis that there is no inter-relationship between tax Revenue collected and the education index of select countries, ‘t’ test has been administered. To develop a prediction model, regression analysis is used.

Results and Discussions

Table 1 shows trends in education index of the five selected countries for the period 2013 to 2018.

Table 1: Education Index of Select Countries

Year	India	France	Italy	Brazil	Canada
2013	0.514	0.801	0.785	0.668	0.868
2014	0.53	0.811	0.788	0.674	0.878
2015	0.54	0.812	0.788	0.677	0.885
2016	0.555	0.809	0.79	0.685	0.89
2017	0.558	0.811	0.793	0.689	0.891
2018	0.558	0.811	0.793	0.689	0.891

Source: United Nations Development Programme Report.

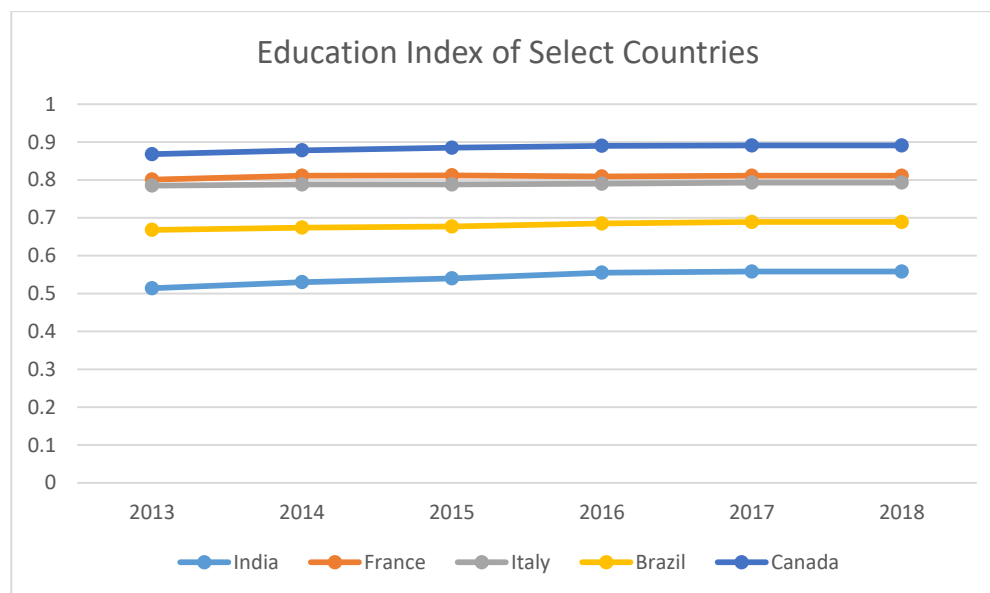


Fig. 1: Graphical Presentation of Education Index of Select Countries

Explore Inter-Relationship between Tax Revenue and Education Index

In order to examine the inter-relationship between tax revenue and education index, correlation has been

calculated. Table 2 shows the correlation between tax revenue collected and the education index of select countries. To test the hypothesis that there is no inter-relationship between tax revenue collected and the education index of select countries, a t-test has been used.

Table 2: Correlation between Tax Revenue and Education Index of Select Countries

Year	India		France		Italy		Brazil		Canada	
	Tax Revenue	Education Index	Tax Revenue	Education Index	Tax Revenue	Education Index	Tax Revenue	Education Index	Tax Revenue	Education Index
2013	1846545	0.514	9,66,817	0.801	7,06,829	0.785	1726353	0.668	5,92,206	0.868
2014	2020728	0.53	9,83,465	0.811	7,05,075	0.788	1830531	0.674	6,23,732	0.878
2015	2297101	0.54	10,02,131	0.812	7,08,768	0.788	1913556	0.677	6,53,264	0.885
2016	2622145	0.555	10,20,206	0.809	7,14,911	0.79	2011724	0.685	6,72,809	0.89
2017	3013223	0.558	10,65,242	0.811	7,27,790	0.793	2118464	0.689	7,02,704	0.891
2018	3494102	0.558	10,91,541	0.811	7,38,820	0.793	26,17,395	0.689	7,32,087	0.891
Correlation (r)	0.892148427		0.53431127		0.896273616		0.816501239		0.967259054	
(R ²)	0.795929		0.285489		0.793544		0.666674		0.8493615	
't' computed value	9.997799		51.87829		130.1688		15.7971		31.72553	
't' table value (5%)	2.228139		2.228139		2.228139		2.228139		2.228139	
P value	1.59E-06		1.71E-13		1.76E-17		2.12E-08		2.28E-11	
't' test result	Significant		Significant		Significant		Significant		Significant	

Source: Own calculation through MS Excel 2013.

Table 2 shows the inter-relationship between tax revenue and the education index of select countries. To check the inter-relationship, correlation has been used. Correlation results show that the select country's tax revenue and education index are highly correlated, except in France. Table 2 shows that in India, the tax revenue collected and education index correlation is 0.8921; this means that both are highly positively correlated. Positive correlation shows that when tax revenue increases, the education index will increase, because the government will spend tax revenue funds on the education of the people through various sources. In India, the result of r^2 , 0.7959, shows that 79.59% variability in education index was influenced by tax revenue, and only the remaining 20.41% variability in education index is influenced by some other factors. For testing the hypothesis that there is a no inter-relationship between tax revenue collected and education index in India, the 't' test has been administered. Results of the 't' test for India shows that the 't' table value, 2.22, is less than 't' computed value, 9.99, at 5% level of significance; this indicates that the hypothesis has been rejected and the p-value is less than 0.05, which shows that a relationship exists between tax revenue and education index in India. Results also indicated that in countries other than France,

i.e., Italy, Brazil, and Canada, tax revenue and education index are highly correlated. In all four countries, 't' table value is less than 't' computed value, at a 5% level of significance, which shows that a relationship exists between tax revenue and education index in the country. Results show that a strong positive correlation exists between tax revenue collected and education index of selected countries, i.e., India, Italy, Brazil, and Canada, except in France.

Development of Country-Wise Prediction Model for Estimating Education Index

For the development of the prediction model of the education index of select five countries, regression analysis has been administered. All five countries' regression prediction models are summarised.

India

Table 3 shows the regression prediction results of the education index for India.

Table 3: Regression Output of Prediction Model of Education Index for India

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.477127342	0.016959736	28.13295	9.5E-06
Tax Revenue	2.56467E-08	6.49314E-09	3.949811	0.016821
R Square	0.795928816	F-Statistic		15.601
Adjusted R Square	0.74491102	Significance F		0.016821
Standard Error	0.009067259			
Regression Equation of Prediction Model				
Education Index (y) = Constant (a) + βIn TR (bx)				
β – Regression Coefficient				
Education Index = 0.477127342 + 2.56467E-08*TR-----Regression Equation				
Education Index (y) = Dependent Variable				
Tax Revenue (x) = Independent Variable				

Source: Own calculation through MS Excel 2013.

The results of Table 3 show the regression output for the prediction of the education index for India. The results show that the intercept value and tax revenue values are statistically significant, because the t statistics value is more than t table value at 5% level of significance. The p-value of both variables is less than 0.05, which means the values are significant. The coefficient of

determination, r^2 , is 0.7959, which means 79.59% of the variability in education index is influenced by tax revenue. The remaining 20.41% variability in education index is explained by factors other than tax revenue. The F statistics, 15.601, shows the overall significance of the regression model. Therefore, there is a positive and significant influence on education index. Tax revenue

is an important instrument for economic development in India. The equation shows the regression model for the prediction of the education index on the basis of tax revenue. Results show that if there is no tax revenue, the government does not spend on education of the people. Still, education index (mean years of schooling and expected years of schooling) would be 0.477, because other factors are responsible for the education level of the people in India. It is indicated that the education index of

a particular country is dependent on tax revenue spent on the education of the people, and other factors.

France

For the development of the prediction model of the education index of France, regression analysis has been administered. Table 4 shows the regression prediction results of the education index for France.

Table 4: Regression Output of Prediction Model for Education Index for France

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.7625541	0.036905093	20.66257	3.24E-05
Tax Revenue	4.5628E-08	3.60925E-08	1.264211	0.274803
R Square	0.28548854	F-Statistic		1.598231
Adjusted R Square	0.10686067	Significance F		0.274803
Standard Error	0.00389276			
Regression Equation of Predication Model for France				
Education Index of France = 0.7625541 + 4.5628E-08*TR -----Regression Equation				

Source: Own calculation through MS Excel 2013.

The results of Table 4 show the regression output for the prediction of the education index for France. The results show that the intercept value, 0.7625, is statistically significant, because its t statistics value is more than the t table value at 5% level of significance. Tax revenue value, 4.5628E-08, is not significant, because the p-value of tax revenue is more than 0.05, which means it is not significant. The coefficient of determination, r^2 , is 0.2854, which means only 28.54% of the variability in education index is influenced by tax revenue. The remaining 71.46% variability in education index is explained by factors other than tax revenue. The equation shows the regression model for the prediction of the education index on the basis of tax revenue. Results show that if there is no tax revenue, the government does not spend on education

of the people. Still, education index (mean years of schooling and expected years of schooling) would be 0.7625, because factors other than tax revenue affect the education level of the people in France. It is indicated that the education index of a particular country is dependent on tax revenue spent on the education of the people, and other factors.

Italy

For the development of the prediction model of the education index of Italy, regression analysis has been administered. Table 5 shows the regression prediction result of the education index for Italy.

Table 5: Regression Output of Prediction Model for Italy's Education Index

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.640551915	0.037992	16.859979	7.25E-05
Tax Revenue	2.07729E-07	5.3E-08	3.9210438	0.017233
R Square	0.793543958	F-Statistic		15.37458
Adjusted R Square	0.741929947	Significance F		0.017233
Standard Error	0.001598403			
Regression Equation of Predication Model				
Education Index of Italy = 0.640551915 + 2.07729E-07*TR + --Regression Equation				

Source: Own calculation through MS Excel 2013.

The results of Table 5 show the regression output for the prediction of the education index for Italy. The results show that the intercept value, 0.6405, is statistically significant, because its t statistics value is more than the t table value at 5% level of significance. Tax revenue value, 2.07729E-07, is also significant, because its t statistics value is more than the t table value. The p-value of both variables is less than 0.05, which means the values are significant. The coefficient of determination, r^2 , is 0.7935, which means 79.35% of the variability in education index is influenced by tax revenue. The remaining 20.65% variability in education index is explained by factors other than tax revenue. The F statistics, 15.374, shows the overall significance of the regression model. Therefore, it has a positive and significant influence on education index. Tax revenue is an important instrument for economic development in Italy. The equation shows

the regression model for the prediction of the education index on the basis of tax revenue. Results show that if there is no tax revenue, the government does not spend on education of the people. Still, education index (mean years of schooling and expected years of schooling) would be 0.6405, because factors other than tax revenue affect the education level of the people in Italy. It is indicated that the education index of a particular country is dependent on tax revenue spent on the education of the people, and other factors.

Brazil

For the development of the prediction model of the education index of Brazil, regression analysis has been administered. Table 6 shows the regression prediction result of the education index for Brazil.

Table 6: Regression Output of Prediction Model for Brazil's Education Index

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.63471	0.016291	38.961706	2.59E-06
Tax Revenue	2.24E-08	7.92E-09	2.8284755	0.047418
R Square	0.666674	F-Statistic		8.000274
Adjusted R Square	0.583343	Significance F		0.047418
Standard Error	0.005593			
Education Index of Brazil's = 0.63471 + 2.24E-08*TR -----Regression Equation				

Source: Own calculation through MS Excel 2013.

The results of Table 6 shows the regression output for the prediction of the education index for Brazil. The results show that the intercept value and tax revenue values are statistically significant, because the t statistics value is more than the t table value at 5% level of significance. The p-value of both variables is less than 0.05, which means the values are significant. The coefficient of determination, r^2 , is 0.6666, which means 66.66% of the variability in education index is influenced by tax revenue. The remaining 33.34% variability in education index is explained by factors other than tax revenue. The F statistics, 8.000274, shows the overall significance of the regression model. Therefore, it has a positive and significant influence on education index. Tax revenue is an important instrument for economic development in Brazil. The equation shows the regression model for

the prediction of the education index on the basis of tax revenue. Results show that if there is no tax revenue, the government does not spend on education of the people. Still, education index (mean years of schooling and expected years of schooling) would be 0.6347, because factors other than tax revenue affect the education level of the people in Brazil. It is indicated that the education index of a particular country is dependent on tax revenue spent on education of the people, and other factors.

Canada

For the development of the prediction model of the education index of Canada, regression analysis has been administered. Table 7 shows the regression prediction result of the education index for Canada.

Table 7: Regression Output of Prediction Model for Canada's Education Index

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.7735464	0.02328	33.2272509	4.89E-06
Tax Revenue	1.664E-07	3.5E-08	4.74906755	0.008977
R Square	0.8493615	F-Statistic		22.55364
Adjusted R Square	0.8117019	Significance F		0.008977
Standard Error	0.0040093			
Education Index of Canada = 0.7735464 + 1.664E-07*TR -----Regression Equation				

Source: Own calculation through MS Excel 2013.

The results of Table 7 shows the regression output for the prediction of the education index for Canada. The results show that the intercept value and tax revenue values are statistically significant, because the t statistics value is more than the t table value at 5% level of significance. The p-value of both variables is less than 0.05, which means the values are significant. The coefficient of determination, r^2 , is 0.8493, which means 84.93% of the variability in education index is influenced by tax revenue. The remaining 15.07% variability in education index is explained by factors other than tax revenue. The F statistics, 22.5536, shows the overall significance of the regression model. Therefore, it has a positive and significant influence on education index. Tax revenue is an important instrument for economic development in Canada. The equation shows the regression model for the prediction of the education index on the basis of tax revenue. Results show that if there is no tax revenue, the government does not spend on education of the people. Still, education index (mean years of schooling and expected years of schooling) would be 0.7735, because factors other than tax revenue affect the education level of the people in Canada. It is indicated that the education index of a particular country is dependent on tax revenue spent on education of the people, and other factors.

Validity of Developed Prediction Model

All Select Countries

In order to check the validity of the regression model developed by us, the predicted education index has been calculated by applying our own developed model. The results are given in the Table 8.

Now, we need to check whether any significant differences exist between the actual education index and predicted education index of all select countries. To check for differences, t-test has been applied. All the results are summarised in Table 8. The results of the t-test show that t statistics for all countries is less than the t table value 2.22, which means there is no significant difference between the actual education index and predicted education index for all the select countries. The p-value is 1, which is more than 0.05; this is evidence that there is no significant difference between the actual education index and predicted education index. The difference is not significant, which indicates that the model developed by us is significant. It can be applied anywhere in the real world.

Table 8: Testing of Regression Prediction Model for All Select Countries' Education Index

Countries	India			France			Italy			Brazil			Canada		
	Actual Education Index (b)	Predicted Education Index (c) $Y = 0.459384807 + 3.42445E-08 * TR$	Square of Mean Difference (d) = (b-c) ²	Actual Education Index (b ¹)	Predicted Education Index (c ¹)	Square of Mean Difference (d ¹) = (b ¹ -c ¹) ²	Actual Education Index (b ²)	Predicted Education Index (c ²)	Square of Mean Difference (d ²) = (b ² -c ²) ²	Actual Education Index (b ³)	Predicted Education Index (c ³)	Square of Mean Difference (d ³) = (b ³ -c ³) ²	Actual Education Index (b ⁴)	Predicted Education Index (c ⁴)	Square of Mean Difference (d ⁴) = (b ⁴ -c ⁴) ²
2013	0.514	0.524 ¹	0.000	0.801	0.807	3.21E-05	0.785	0.787	5.67E-06	0.668	0.673	2.90E-05	0.868	0.872	1.67E-05
2014	0.53	0.529	1.10E-06	0.811	0.807	1.28E-05	0.788	0.787	9.68E-07	0.674	0.676	2.97E-06	0.878	0.877	4.45E-07
2015	0.54	0.536	1.57E-05	0.812	0.808	1.38E-05	0.788	0.788	4.69E-08	0.677	0.678	3.39E-07	0.885	0.882	7.58E-06
2016	0.555	0.544	1.13E-04	0.809	0.809	1.09E-08	0.79	0.789	8.85E-07	0.685	0.680	2.72E-05	0.89	0.885	2.03E-05
2017	0.558	0.554	1.29E-05	0.811	0.811	2.54E-08	0.793	0.792	1.60E-06	0.689	0.682	4.66E-05	0.891	0.890	2.78E-07
2018	0.558	0.567	7.64E-05	0.811	0.812	1.85E-06	0.793	0.794	1.05E-06	0.689	0.693	1.89E-05	0.891	0.895	1.90E-05
Average	0.5425	0.5425	5.48E-05	0.809	0.809	1.01E-05	0.7895	0.7895	1.70E-06	0.680	0.680	2.09E-05	0.883833	0.884	1.07E-05
t Stat	0	0	6.45375E-14	0	0	6.45375E-14	1.29349E-14	0	0	0	0	0	0	0	0
t Critical two-tail	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22
p value	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Result	Not Significant	Not Significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant

Source: Own calculation through MS Excel 2013.

Best Regression Prediction Model

The best model for prediction of education index from select countries needs to be identified. A comparison has been made in Table 9.

Table 9 shows the average values of (square of the mean difference) the actual education index and

predicted education index. The table shows that the country with the lowest square of the mean will be the country with the best prediction model. The result shows that Italy's square of the mean value is 0.00000170, which is the lowest. This shows that Italy's education index prediction model is the best.

Table 9: Identifying the Best Model for Prediction of Education Index in All Countries

Countries	India	France	Italy	Brazil	Canada
Square of Mean difference	0.0000548	0.0000101	0.00000170	0.0000209	0.0000107

Source: Own calculation through MS Excel 2013.

Regression Prediction Models Developed by Us

Table 10 shows a summary of regression prediction models for estimation of education index.

Table 10: Regression Prediction Models of All Countries

S. No.	Country	Regression Prediction Model
1.	India	Education Index = 0.477127342 + 2.56467E-08*TR
2.	France	Education Index = 0.7625541 + 4.5628E-08*TR
3.	Italy	Education Index = 0.640551915 + 2.07729E-07*TR
4.	Brazil	Education Index = 0.63471 + 2.24E-08*TR
5.	Canada	Education Index = 0.7735464 + 1.664E-07*TR

Source: Own calculation on MS Excel 2013.

Concluding Remarks

The education index of a particular country depends on the education level of the people in that country. The study found that the tax revenue of select countries and the education index are highly correlated. Results of correlation show that Canada's tax revenue and education index are highly correlated compared to other countries. The results of the t-test are evidence that the correlation results are significant for all the selected countries. However, out of all the countries, France's tax revenue to education index correlation is very low. Results also show that this study developed a prediction model of education index for select countries. In all the five countries, the results of the t-test show that the regression prediction model has been significant, and the difference between the actual education index and the predicted education index is not significant; it indicates that the model developed by us is significant. It can be applied

anywhere in the real world. The results found that Italy's prediction model for the education index is the best. The prediction models of the selected countries can be used to identify a particular target of education and how much tax revenue will be required to enhance the education level.

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