The Organization of Islamic Conference (OIC) Countries: Growth Performance Based on Discriminant Analysis Technique

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The purpose of this study is to analyze the performance of the Organization of Islamic Conference (OIC) countries based on economic variables (Gross Domestic Product, export, inflation, Foreign Direct Investment, education/literacy rate, saving, and total manufacturing output) for the period of 1990 to 2002. The OIC countries are classified based on 4 geographical groups of regions (Africa, Asia, Middle East and Western Hemisphere). To achieve its purpose, this study used multivariate technique based on discriminant analysis procedure as tool to explain growth performance among the OIC countries. The empirical result suggests that education, export and GDP are the most important factor in explaining the growth performance among the four geographical grouping of the OIC countries. In addition, it also suggests that education is the main factors in determining growth performance of OIC countries.

Field of Research: Economic Growth and Trade

(1) Introduction

The Organization of Islamic Conference (OIC) is an inter-governmental organization consists of fifty-seven (57) countries. These countries have decided to pool their resources together, combine their efforts and speak with one voice to protect their interests and ensure the progress and well being of their people and those of other Muslims in the whole world. The Organization was established in Rabat, Kingdom of Morocco, on 12 Rajab 1389H (25 September 1969). The purpose of this Organization is to strengthen solidarity and cooperation among Islamic countries in politics, economics, cultural, scientific as well as social aspect (www.oic-oci.org).

The Organization of Islamic Conference (OIC) initially started as a political forum, based on the realization that effective joint political action has to be complemented by wide ranging joint economic action. In fact, the charter of the Organization of Islamic Conference, approved in February 1972, reiterated the necessity of cooperation for community-wide economic progress and the need to help the individual member countries to develop their productive capacities at an accelerated pace (Sadi Cindoruk, 1992). Economic development is one of the objectives of every society and very often- economic growth is seen as fundamental for economic development. In

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the literature on trade, aid and development, it is often assumed that both trade and aid are important factors influencing domestic growth. As a result, the impact of policy reform on economic performance is still very much a topical issue in developmental economics (Anwer and Sampath, 2002).

The economic performance of OIC countries was examined in term of their GDP, inflation, export, FDI, education (adult literacy rate), total manufacturing output and saving for different groups of regions of OIC countries and the overall OIC countries. According to the data of GDP at current market prices (in US Dollar) of OIC countries in 2002, the income of Africa region was $237.313 billion which made up only 16.04 percent of the $1,479.6 billion total OIC income. The cumulative GDP for all countries in Asia region was $634.857 billion or 42.91 percent of the total OIC income. Meanwhile, the total income of the Middle East region was $605.986 billion or 40.96 percent of the total OIC countries GDP. Western Hemisphere, on another hand, generated $1.447 billion or 0.09 percent of the total OIC income. Obviously, that the income in both African and Western Hemisphere are very low compare to other regions. Their income are even less than the national income of some individual OIC member countries such as Indonesia ($ 171.391 billion), Turkey ($ 184.162), Saudi Arabia ($188.804) and Iran ($134.053 billion).

On the other hand, the shares of Asia and Middle East trade and world growth are quite high. Thirty countries from these regions generated 83.87 percent of the overall OIC output in 2002. Four countries, i.e. in Asia (Indonesia and Turkey) and Middle East (Saudi Arabia and Iran) contributed 45.85 percent to the overall OIC income. Due to this fact, the overall growth of the OIC countries is much affected by growth in these two regions and does not reflect the balanced growth in all regions. Similarly, within these two regions, where the growth of the four major countries as mentioned above, has significantly influenced the performance of the regions.

Table 1 shows the average growth rate for 4 groups of regions and the overall OIC countries during the period 1990-2002.

Table 1: Real GDP Growth Rate in OIC Countries (Annual average in percent)

	1990	1995	1996	1998	2001	2002
AFRICA	12.1	2.3	4.4	3.5	1.8	11.6
ASIA	-3.3	2.9	3.7	2.3	0.9	17.9
MIDDLE EAST	-3.8	2.6	4.2	3.5	22.9	-10.7
WESTERN.HEMISPHERE	4.5	4.0	4.0	0.2	-5.3	12.7
OIC	5.6	2.6	4.1	3.1	6.3	8.0

Sources : Compiled from SESRTCIC
Notes :Averages were computed on the basis of percentage changes for individual countries weighted by GDP at current market prices in dollars.

(2) Growth Analysis of OIC Countries

The average growth rate in Africa region realized a very high rate of growth of 12.1 percent in 1990. However, this region experienced a negative growth rate of -2.2 percent in 1991. After 1991, the rate of growth in Africa region experienced moderate rates. But then, it has increased again to 11.6 percent in 2002.

In Asia region, the average growth rate recorded negative rates of -3.3 percent in 1990. Then, it increased to 11.1 percent in 1991. However, it declined again in 1992 to 7.6 percent, and in 1993 and 1994, this group realized negative growth rate of -2.0 percent and -4.3 percent respectively. The following years, average growth rate in Asia region recorded positive growth. And in 2002, they realized a very high rate of growth of 17.1 percent. On the other hand, Middle East region has realized a very high rate of growth in 1992 and 2001. However, this region has experienced a negative growth rate in 1990, 1999 and 2002.

The last group is Western Hemisphere region which experienced a positive growth of 4.5 percent in 1990, and 7.3 percent in 1992, and then declined to negative growth in 1993 and 1994**.** This group managed to increase its growth rate significantly to 4.0 percent between 1995 and 1996. However, in 1998 has recorded a decreased to 0.2 percent. Western Hemisphere has recorded a high rate of growth in 1997 (9.9 percent) and 2002 (12.7 percent).

Inflation is one of the most important indicators of an economy's health. Price movements show whether there are any excess demand or excess supply exists in an economy. A low and steady inflation rate is regarded as an indication of the stability of an economy and it is a necessary condition for stable growth of the economy. During the period of 1990-2002, the average inflation rates in four regions are fluctuated up and down. The trends of inflation rates among the OIC countries did not change much. The inflation had a tendency to increase between 1991 and 1994, where the highest inflation rate was realized in 1994. Though, it began to decrease in 1995-2002.

Exports have been the main engine of economic growth, especially for developing countries such as the OIC countries. In 1990, the exports of the OIC countries achieved $260.196 billion and $507.873 billion produced in 2002. In addition, the highest total amount of export was recorded in 2000, at $514.081. Table 2 shows average rate of growth of exports in OIC countries for the period 1990-2002. The highest average rates of exports of all OIC countries occurred in 2000, at 65.6 percent.

Table 2: Annual Growth Rate of Exports in OIC Countries (1990-2002)

	1990	1995	1997	1998	2000	2001	2002
AFRICA	33.3	12.4	11.7	-3.8	95.7	2.1	21.7
ASIA	9.5	38.5	3.7	-9.4	52.1	-1.0	4.7
MIDDLE EAST	19.4	22.1	18.9	-11.7	36.3	1.9	7.6
WESTERN HEMISPHERE	-13.5	19.9	30.6	-19.3	-3.4	1.5	-6.0
OIC	23.7	22.1	1.6	-4.6	65.6	1.2	12.4

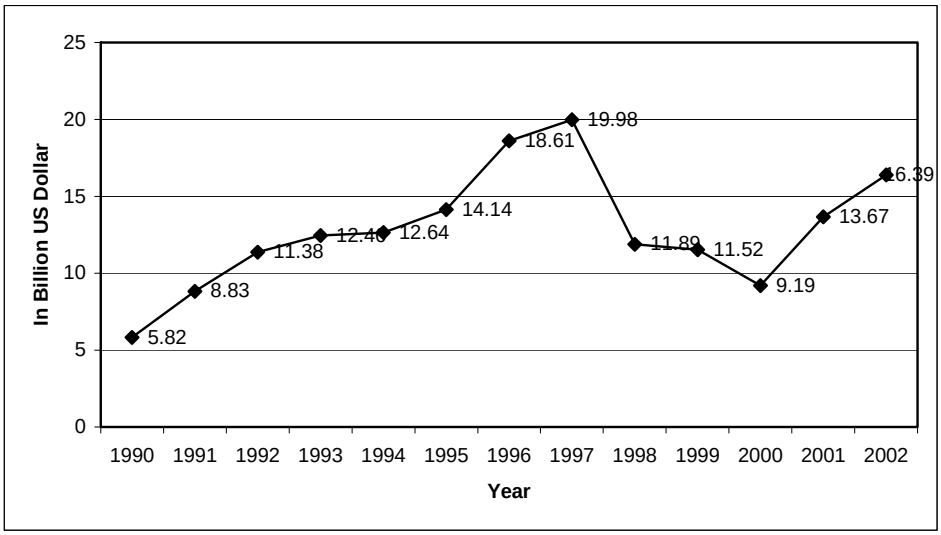
Sources: : Compiled from SESRTCIC

In the last few decades, FDI has become a major force of market integration in the world economy. The role of FDI in the world economy would be significantly greater, if the impact of FDI on various economic activities is considered. Foreign Direct Investment has contributed significantly to economic growth and efficiency in the OIC countries. In addition, to financing capital formation FDI has facilitated the transfer of technology and managerial skills. It is therefore, desirable to increase the flow of FDI into the country. Nevertheless, the FDI inflow is concentrated to only 5 of the OIC member countries, namely Malaysia, Azerbaijan, Morocco, Kazakhstan and Brunei. It is due to the lack of information to attract potential investors to the other OIC countries

Figure 1 shows the total of foreign direct investment in the OIC countries for the period 1990-2002. FDI generally rises during 1990-2002, however falls in 1998, due to the Asian financial crisis. This crisis has caused some OIC countries to experience a negative growth of FDI inflow in 1998. In the year 2002, the FDI inflow to the 57 member countries is $16.39 billion, and Malaysia received the highest FDI inflow of $3.2 billion compared to other OIC members.

In all developing countries, education is an important mechanism to achieve a high and steady growth and development. In the 1990s, more than three-quarters of school-age children were enrolled in schools. This number has increased from less than half in the 1960s. Illiteracy rates, consequently, has dropped from 39 to 30 percent between 1985 and 1995. Nonetheless, the progress has been uneven across regions. Enrolment rates in Sub-Saharan Africa, for example has declined where the proportion of 6-11 years old enrolled in schools was 51 percent in 1992, compared to 59 percent in 1980 (Vinod, 2000).

Figure 1: Total Foreign Direct Investment in OIC Countries 1990-2002 (In Billion US Dollar)



Sources: : Compiled from SESRTCIC

The annual average of adult literacy rates in the OIC countries increased during 1990-1999. However, in 2000, literacy rate declined to 95.9 percent. It increased again in 2000-2002. From 1991 to 1995, the services sector is an important source of income in almost all the OIC countries, irrespective of their levels of income and development. However, in Africa region, agricultural sector is still an important contributor to their national income since most of the Africa region is less developed countries. Asia and Middle East regions on the other hand, are less dependent on agriculture and depend more on industrial sector. The industrial sector in the Middle East region however is more concentrated on oil production activities. Meanwhile in Asia, manufacturing activities are the most important component in their industrial sector. (see table 4 below)

According to Harrod-Domar model, saving would encourage or stimulate the economic growth represented by increasing in national income. The increasing national income will be added to capital stock for investment in given amount. Thus, it will contribute towards the capital-output ratio (ratio between capital and output). Gross domestic saving in OIC countries is increases during 1990-1997, but declined in 1998 and increase again in 1999-2000.

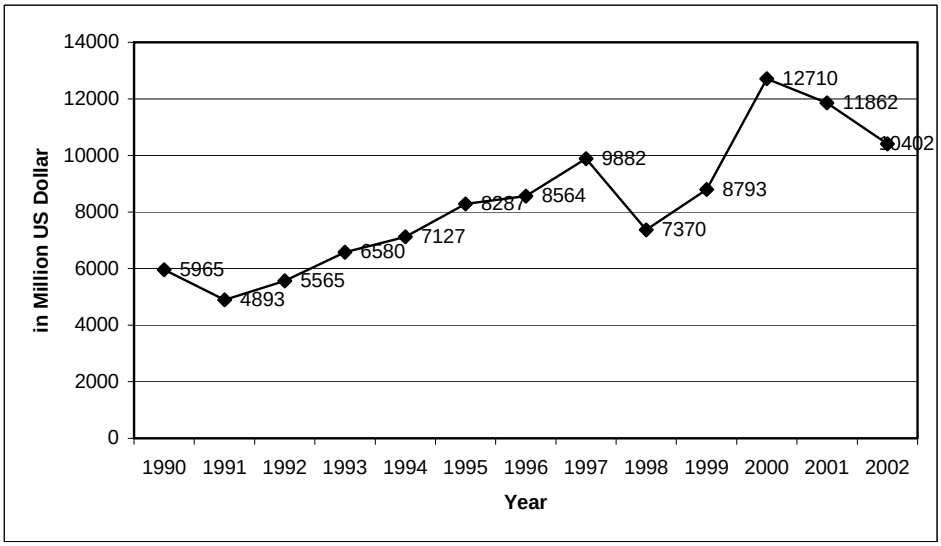
Table 4: Average Sectoral Growth(%)to GDP in OIC countries (1990-2001)

	Agriculture	Industry	Manufacturing	Service
AFRICA	32.5	22.6	9.4	42.7
ASIA	25.3	32.6	16.2	41.9
MIDDLE EAST	10.6	39.3	10.5	49.9
OIC	18	36.4	15.2	45.4

Sources : : Compiled from SESRTCIC

Note : OIC countries except Cote d'Ivoire (Africa), Afganistan (Asia), Palestine (Middle East), Guyana and Suriname (Western Hemisphere)

Figure 2: Gross Domestic Saving in OIC Countries 1990-2002 (Annual average, in Million US Dollar)



Sources: : Compiled from SESRTCIC

(3) Methodology and Research Design (Data Treatment and Estimation)

The results of running (four groups) stepwise discriminant analysis on the 57 OIC member countries for period of 1990-2002 (741 analysis samples) using SPSS are presented in the following tables. OIC countries are classified into 4 geographic groups of regions. The question of interest is whether OIC countries that include Africa (1), Asia (2), Middle East (3), and Western Hemisphere (4), can be differentiated based on economic variables such as Gross Domestic Product (*gdp*), total exports (*export*), rate of inflation (*inflation*), foreign direct investment (*fdi*), education/ adult literacy rate (*educ*), saving (*saving),* and total manufacturing output (*manufact*).

Table 5 presents the results of estimating 4 groups discriminant analysis. An examination of group means indicates that *gdp* appears to discriminate the group more broadly than any other variables. The standard

deviations for the Western Hemisphere regions are considerably smaller than those for the other region.

Table 5: Groups Means and Groups Standard Deviations

Group Statistics

group		Mean	Std. Deviation	Valid N (listwise) Unweighted	Valid N (listwise) Weighted
Africa	gdp	13211.10	18474.94068	126	126.000
	export	3046.0476	4435.61429	126	126.000
	inflation	11.4097	18.30103	126	126.000
	fdi	184.5397	371.30853	126	126.000
	educ	45.3869	17.18265	126	126.000
	saving	2715.9365	5462.93075	126	126.000
	manufact	3773.1984	5379.73015	126	126.000
Asia	gdp	74192.33	65994.69348	57	57.000
	export	24244.60	25671.99928	57	57.000
	inflation	15.1016	23.02794	57	57.000
	fdi	1486.4912	1884.00141	57	57.000
	educ	72.9626	25.46293	57	57.000
	saving	22076.25	21860.40495	57	57.000
	manufact	45723.44	52859.16028	57	57.000
Middle East	gdp	51326.56	84388.82463	50	50.000
	export	5567.7600	6163.12526	50	50.000
	inflation	8.9846	11.74627	50	50.000
	fdi	242.1640	332.63548	50	50.000
	educ	63.2520	19.52259	50	50.000
	saving	12888.84	28221.07721	50	50.000
	manufact	18238.30	29241.88509	50	50.000
Western Hemisphere	gdp	587.5000	35.18380	6	6.000
	export	571.3333	34.77739	6	6.000
	inflation	6.3300	3.54708	6	6.000
	fdi	60.8333	19.04118	6	6.000
	educ	98.2333	.21602	6	6.000
	saving	113.5000	40.21318	6	6.000
	manufact	17.3333	2.58199	6	6.000
Total	gdp	35411.78	58095.85418	239	239.000
	export	8567.1967	15865.93793	239	239.000
	inflation	11.6553	18.28774	239	239.000
	fdi	503.9967	1111.27481	239	239.000
	educ	57.0277	23.86600	239	239.000
	saving	9396.1381	18946.08515	239	239.000
	manufact	16709.95	33858.55632	239	239.000

The pooled within groups correlation matrices (table 6) indicates some correlation of *saving, manufact,* and *export* with *gdp*. This implies that the increase in savings, manufacturing and exports can stimulate the growth of GDP. *Inflation*, on the other hand, has a negative correlation with *export* and *fdi*. This means that as inflation get higher, it will affect the exports and FDI by causing them to fall. The low correlation coefficients among the variables indicate that multicollinearity is unlikely to be a problem.

Table 6: Pooled Within-Groups Matrices

		gdp	export	inflation	fdi	educ	saving	manufact
Correlation	gdp	1.000	.503	.226	.249	.185	.932	.732
	export	.503	1.000	-.005	.554	.261	.579	.599
	inflation	.226	-.005	1.000	-.119	.019	.141	.313
	fdi	.249	.554	-.119	1.000	.119	.326	.382
	educ	.185	.261	.019	.119	1.000	.205	.221
	saving	.932	.579	.141	.326	.205	1.000	.657
	manufact	.732	.599	.313	.382	.221	.657	1.000

In term of model and as shown in table 7, *educ* (education/ adult literacy rate) has the largest univariate test to enter and likewise, the smallest value of wilks' lambda (37.229 and 0.678); so, this variable is included in the model first. At step 1 in the *variables in the analysis* table, educ is listed as the only variable in the model. Based on the same table, *export* (total export in US Dollar) has the largest significant value(based on F-test to enter and the smallest wilks' lambda (24.766 and 0.514); so, at step 2 in the *variables in the analysis*, both *educ* and *export* are included in the model. Further reiteration in the models shows that, GDP are selected because it has the largest statistical value to enter and the smallest wilks' lambda (5.979 and 0.478); so, at step 3 in the *variables in the analysis,* GDP are included in the model together with both *educ* and *export.*

Table 7: Variables in the Analysis

Step		Tolerance	F to Remove	Wilks' Lambda
1	educ	1.000	37.229	
2	educ	.932	26.328	.688
	export	.932	24.766	.678
3	educ	.928	24.924	.631
	export	.718	16.811	.581
	gdp	.744	5.979	.514

The result of the stepwise method (by looking at wilks' lambda method) in table 7 shows the reduced set of independent variables from a total of 7 to 4 variables. Firstly, the set of independent variables consists of *gdp, export, inflation, fdi, educ, saving* and *manufact*. Then, the set of variables has only *gdp, export* and *educ*. Table 8 also shows that the most important factor in discriminating among 4 geographic groups of regions of OIC countries is *educ* (education). *Export* is second most important discriminating variable and subsequently, followed by *gdp.*

For the three variables, the values of wilks' lambda are 0.678, 0.514 and 0.478 respectively. These values then transformed to a chi-square of 37.229, 30.745 and 22.352 with 1 and 2 degrees of freedom, which are

significant beyond the 0.05 level. Thus, the three variables together are significantly to discriminating the groups.

Table 8: Variables Entered/Removed [a,b,c,d] (Wilks' Lambda Method)

		Wilks' Lambda											
						Exact F				Approximate F			
Step	Entered	Statistic	df1	df2	df3	Statistic	df1	df2	Sig.	Statistic	df1	df2	Sig.
1	educ	.678	1	3	235.000	37.229	3	235.000	.000				
2	export	.514	2	3	235.000	30.745	6	468.000	.000				
3	gdp	.478	3	3	235.000					22.352	9	567.211	.000

At each step, the variable that minimizes the overall Wilks' Lambda is entered.

a. Maximum number of steps is 14.

b. Minimum partial F to enter is 3.84.

c. Maximum partial F to remove is 2.71.

d. F level, tolerance, or VIN insufficient for further computation.

The eigenvalue associated with first function is 0.640, and this function accounts for 70.8% of variance in the data. The second function has a small eigenvalue of 0.202 and accounts for 22.4% of variance in the data. And the last function or the third function has a smallest eigenvalue of 0.061 and account for only 6.8% of the variance. The first function has a large of eigenvalue which indicate that it is better than the second and third function to explain the variables. The model also indicate that canonical correlation associated with first function is estimated at 0.625. The square of this correlation $(0.625)^2$= 0.39, indicates that 39% of the variance in dependent variable is explained or accounted for by this model. For the second function the canonical correlation is 0.410. The square of this correlation $(0.410)^2$= 0.168, indicates that 16.8% of the variance in dependent variable is explained or accounted for by this model. And the third function is 0.241. The square of this correlation $(0.241)^2$= 0.058, indicates that only 5.8% of the variance in dependent variable is explained or account for by this model. The overall function has a total the square of correlation 0.616 or 61% indicates that the independent variables are explained, while the others were not accounted in this model.

To test the null hypothesis of equal group centroids, the overall function must be considered simultaneously. In other words, the hypothesis tests of the means (centroids) for all functions (the three canonical variables) are equal for the four groups. A chi-square is used to determine significance, and the significance level is less than 0.05, so the hypothesis is rejected, thus indicating significant discrimination. In table 10, the test of function *1 through 3* (no functions have been removed), has the value of Wilks' Lambda is 0.478 and chi-square of 173.238 with 9 degrees of freedom, which is significant beyond the 0.05 level. Thus, all functions are significant to discriminate among the four groups.

The test of function *2 through 3* has the value of Wilks' Lambda is 0.784, chi-square of 57.178 with 4 degrees of freedom, and the associated significant level, indicating that centroids of functions *2 through 3* differ significantly across the four groups (Table 9). Next, when both function 1 and 2 are removed, Wilks' Lambda associated with *3* function is 0.942, and still significant at the 0.05 level. Therefore, it can conclude that the test of function for all functions contributes significantly to group differences.

Table 9: Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	.478	173.238	9	.000
2 through 3	.784	57.178	4	.000
3	.942	13.980	1	.000

The interpretation of the results is aided by an examination of the standardized canonical discriminant function coefficients, the structure matrix, and certain plots (scatter diagram and territorial map). Generally, the independent variables with relatively large standard coefficient contribute more to the discriminating power of the function as compared to smaller coefficient. The standard coefficients indicate a large coefficient for *educ* on *function 1*; whereas *function 2* has relatively larger for *export* and *function 3* has relatively larger coefficient for *gdp.* In examination structure matrix, all of the independent variables are included, not only the three variables in the final model. For each variable values with an asterisk marks (*) have the largest absolute correlation with one of the three functions. With each function, these marked variables are then ordered by the size of the correlation (See Table 10.

Table 10: Structure Matrix

	Function		
	1	2	3
educ	.799*	-.562	-.215
export	.758*	.646	-.086
manufact[a]	.592*	.288	.418
fdi[a]	.397*	.382	-.074
gdp	.583	.199	.788*
saving[a]	.617	.259	.661*
inflation[a]	.060	-.045	.254*

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.

*. Largest absolute correlation between each variable and any discriminant function

a. This variable not used in the analysis.

(4) Discussion of Findings

From the empirical results obtained it can be summarized that the geographical grouping among OIC countries were based on economic variables such as Gross Domestic Product (GDP), export, inflation, Foreign Direct Investment (FDI), education (adult literacy rate), saving and total manufacturing output. Group means indicate that GDP appears to separate the group more widely than any other variables. Standard deviations for Western Hemisphere are smaller than other regions, where Western Hemisphere region consist of 2 countries, namely Guyana and Suriname.

The significant value of the univariate F-Ratio indicates that when independent variables are considered individually, only inflation is not significant in differentiating the 4 regions. Thus, to examine the economic performance of OIC countries, inflation rate does not differ significantly among the 4 regions. This is due to the negative relationship of the inflation rate with the other variables, especially with GDP or economic growth. This means, the higher the rate of inflation, the slower the economic growth. Correlation matrix indicates some positive correlation of savings, manufacturing and exports with GDP: the increases in saving, manufacturing and exports can stimulate the growth of GDP. Inflation has a negative correlation with export and FDI. This means that the higher inflation can be decreased of export and FDI in the country. Stepwise method shows only GDP, Export, and education affects the significant differences between the groups. The economic growth of the OIC countries as a group realized positive rates of growth during the period of 1990-2002. However, there are imbalances in the economy among the 57 OIC countries, whereby the GDP per capita of the 5 richest countries (Arab Saudi, Iran Iraq, United Arab Emirates and Kuwait) are more than $10,000 million/year, while the other countries are less than $1,000/year. To anticipate with this issue, the rich OIC countries are expected to provide market access in order for the other countries to attract new investments, increase export and income and consequently, stimulate the economic growth and eradicate poverty.

(5) Conclusions

Economic growth is arguably the issue of primary concern to economic policy makers. Economic growth statistics are among the most widely publicized measures of economic performance and are always discussed with interest. Based on empirical results, Africa and Asia are differentiated based on education. Education is an important factor to reducing the gap of poverty and also restructuring the society. The growth of education has brought about the rise in economic growth.

Based on the empirical results suggest that education, export and Gross Domestic Product are the most important economic variables in discriminating between 4 regional groupings of OIC countries. In addition, it also suggests that education is the main factors determining performance in OIC countries. Lastly, education seems likely to encourage economic growth not only by increasing and improving human capital but also social capital, that is, by reducing inequality. If so, the adverse effects of inequality on economic growth since the mid-1960s that have been reported in the literature may in part reflect the positive effect of more and better education or human resource development on growth.

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