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2000

IIUM Journal of Economics and Management 8, no. 2 (2000): 157-87

DETERMINANTS OF HUMAN RESOURCE DEVELOPMENT: AN EMPIRICAL ANALYSIS

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ABSTRACT

Based on the annual Human Development Report of the UNDP, this paper finds that the main determinants of the level of human resource development measured by the HDI for various economies are usually the level of per capita income, its rate of growth, expenditure on military, and the state of income distribution. It is found that even as the HDI is positively correlated with the GDP, the relationship tends to weaken at higher income levels, improvement in the HDI tends to lag behind income growth, and the rise in military expenditure works against the development of human resources. The background of the study is that of developing economies facing serious problems of poverty alleviation. Attention is also paid to the position of Muslim countries.

JEL classification: O15, O50

Key words: Human resource development, Human Development Index, Poverty alleviation

1. INTRODUCTION

Human resource development or HRD is concerned with improvements in the quality of people as agents of production in developing economies.[1] Natural resources and accumulation of capital remain important, but improvements in human factor are considered decisive.[2] The issue has emerged in recent decades as a central piece in policy formulations for economic development.

*The author is grateful to his colleague, Mansor Ibrahim, who went through an earlier draft of the paper and made some valuable comments for improvement. Thanks are also due to the two anonymous referees for their useful suggestions. However, the usual disclaimer applies.

The emancipation of the poor and the deprived is seen linked essentially with an increased investment in the provisions for health care and education,[3] as also with the access to resources for overall well-being.

Improvements in health care, education, and resource availability frequent the literature on the subject not only because they play a critical role in enhancing people's capabilities and skills, but they also have an additional advantage of being measurable. It is well recognized that non-quantifiable factors are also important in the matter; the right sort of motivations, value systems, attitudes, institutions and so on, contribute in no less a measure to the erecting of appropriate 'human infrastructures' in the developing economies. The issue does not entail merely economic but also sociological, cultural, political, religious, and psychological considerations; its solution essentially calls for an inter-disciplinary approach. However, if efforts were made to integrate all the diverse elements into a single model, the analysis may become too cumbersome to yield any valid or fruitful results.[4] Economists, therefore, choose to confine their explorations to the realm of manageable variables which preferably can also be measured in some way.

The United Nations Development Program (UNDP) provides one leading example of this type of exercise. For a decade its Human Development Report (HDR) has nagged policy-makers, albeit with little effect, to put people in the forefront in designing growth strategies because the efforts would be meaningless if development does not reach the deprived and involve them in the process. Even a cursory glance through various volumes of the Report, which is published annually, is sufficient to convince one of the usefulness and feasibility of the wide ranging, sometimes novel, ideas and proposals it contains. These reports are distinctively pro-poor, and in that are poles apart from those of the IMF and the World Bank. However, to provide an appraisal of the UNDP's work is not the objective of this paper. It is mainly an exploratory exercise with a limited scope. The Program is mentioned because the paper relies on the analysis of the insightful data its reports provide.

The paper aims at exploring (i) the nature of the relationship between human development and average income levels, (ii) the impact of income growth, inequalities, and military expenditure on human development, and (iii) the comparison of the position of Muslim countries with overall tendencies on these issues to find possible departures, and the reasons for them. The paper has four sections including the present one. The following section discusses the nature of data and major techniques used in the work. Section three presents the results and their analysis. The last section contains the summary of findings and a few concluding remarks. An appendix containing relevant data is also provided. The computer package SPSS 0.7 for Windows was used to obtain the results.

2. DATA AND METHODOLOGY

The statistical information provided in each HDR lags behind usually by two years from the date of its publication. However, the Report for 1998, the latest available at the time of writing, mostly contains data on various economic aspects of the countries listed with a three-year gap, i.e., not going beyond 1995. Thus, the work based on the information provided in the Report may look stale, even if it were published within a reasonable period of time. Furthermore, time series analysis for individual countries may not be very fruitful as the coverage and definitions have not remained uniform over the years. In addition, the period so far covered by the Report, which is 10 years, does not seem adequate for such an exercise. We shall, therefore, use cross-sectional data concerning the variables relevant to our purpose. In other words, the data used for model construction would relate to one point in time, or may be some sort of periodic average, for each country included in the sample. The idea is to establish relatively universal and stable relationships, which may be of value despite the data not being so recent.

Our first task is to investigate the nature of the overall relationship between the level of real per capita income and the level of human development. To measure the income level the Report uses the gross domestic product (GDP) per capita in purchasing power parity US dollars (PPP$) as a proxy, which is generally an acceptable approximation. The level of human development is quantified in the form of what is called a Human Development Index or the HDI. The procedure of constructing the Index is explained in every issue of the Report.[5] It is measured as the simple mean of three components: (i) longevity, which mainly depends on the provision of food and medical facilities; (ii) education level, which is measured by combining the ratios of adult literacy, and enrollment in the institutions of learning, with their relative weights being 2/3 and 1/3, respectively; and (iii) the contribution of income to living standards. A maximum and a minimum threshold value are specified for each of these components. The minimum value is in each case deducted from the observed or estimated value of the variable for a country and the result is divided by the maximum value minus the minimum. Thus, the technique used is such that no component individually or their mean giving the HDI can exceed 1 in value.

The maximum and minimum values for age are fixed at 85 and 25 years, while longevity is measured by the expected age at birth. The maximum and minimum ratios in the case of education are taken as 100 and 0 respectively in each case prior to averaging to obtain the final value. The estimation of the income component is rather complicated. The world's average income in any year is treated as the threshold income for each country. If the income of a country is more than the threshold, it is adjusted by using a discounting procedure based on the Atkinson's formula for the utility of income. The

adjusted income equals the threshold income plus twice the square root of the excess of actual income of a country over the threshold $40,000 (PPP$). It is discounted using the same formula to give the maximum value, while $100 (PPP$) is taken as the minimum income. The minimum is deducted from the adjusted income of a country and the result is divided by the difference of the maximum and minimum values to get the income component. It may be noted that the adjustment is made to the *real* GDP per capita of those countries only where the amount is more than the threshold income, this figure for 1995 being $5,990 (PPP$). For countries with lower amounts of income, no such adjustment is made. In these cases, the numerator is just the difference between the actual income and the minimum amount, i.e., $100 (PPP$).

Several queries may be raised about the complex procedure.[6] But even if we were to ignore them, one effect of the technique may be noted. The adjustment tends to make the HDIs for high income countries smaller relative to those in lower income categories. This reduces the variability of HDIs considerably *vis-à-vis* the variability of income. This is obvious because the size of the income component of the HDI in the case of high income countries will be reduced compared to that of the countries having less than the threshold income. Even otherwise, the values of HDIs would invariably be less than 1, while incomes range from hundreds to tens of thousands, the variance of the former would be almost negligible compared to that of the latter to vitiate regression analysis.[7]

We experimented with various curves to find the nature of relationship between the HDI and per capita GDP. We found that the best fit to the data is provided by the cubic formulation of the relationship in all cases. The linear model gives the worst results even with logarithmic transformation.[8] In addition to the non-linear relationship between the variables, they are expressed in different units, and their variances differ too widely. Hence, we have replaced the observed values with their ranks, assigning the first rank R to the smallest value.[9] Thus, we have reversed the order of ranks provided in Table 1 of the 1998 Report to make them read logically on the diagrams; for example, ranks increasing along the x-axis would show that the observed incomes are rising. Likewise, the rising ranks up the y-axis would indicate the corresponding improvements in human development.

However, a rank, as opposed to the observed value, indicates not the precise measure, only the relative level (R_{HDI}) of human development and the corresponding income level (R_{GDP}). The replacement offers important advantages without sacrificing much in the process. To begin with, linear regression models can now be used, though cubic estimations may still be superior in some cases. The results in Tables 1A and 1B, based on the population of 174 countries for the year 1995, provide an illustration.

TABLE 1A
Model 1: Descriptive Statistics

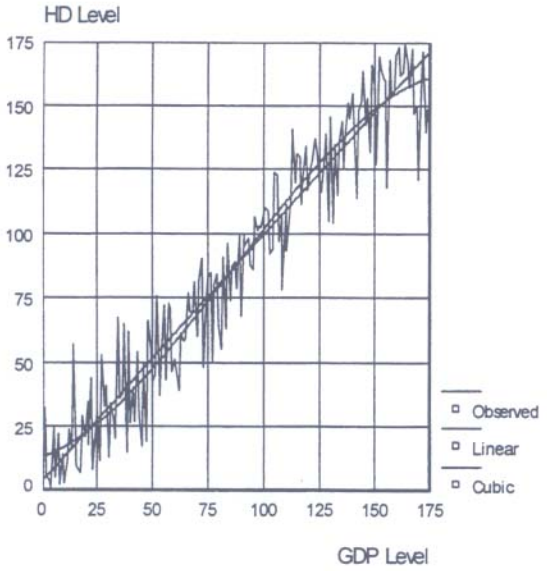
Variable	Mean	Standard Deviation	*N*
HD Level	87.5	50.37	174
GDP Level	87.5	50.37	174

TABLE 1B
Model 1: Regression Results

Independent Variable: GDP Level

Dependent Variable	b_0	b_1	b_2	b_3	R^2	d.f.	F	Significance
Linear Estimation								
HD Level	3.7130	0.9576			0.917	172	1898.55	0.000
Cubic Estimation								
HD Level	12.9942	0.3202	0.0092	-4.E-05	0.922	170	667.81	0.000

FIGURE 1
The Graphical Depiction of the Relationship
Between HD and GDP Level



The means and variances of the ranks are virtually the same for each case. In the linear model, there is no difference between the two regression coefficients ($b_{HDI/GDP}$ and $b_{GDP/HDI}$) or between them and the Karl Pearson's coefficient of correlation. Also, r for the ranks and the rank correlation coefficient R_K for the observed values coincide. The standardized and non-standardized regression coefficients are also equal.[10] The linear models would thus highlight only the underlying relationships between the variables, other things remaining the same. Lastly, multiple regression can now be used and the inclusion of additional predictors no longer poses problems. In the present case, they comprise, as we shall see, of ratio estimates, and their magnitudes fall well in line with those of the ranks.[11] Finally, we can go back to the original data in estimation via a regression equation linking the HDI values to their ranks. For instance, by placing the R_{HDI} value estimated from any of our models in the following quadratic equation we can obtain a fairly close estimate of the corresponding HDI: $Estimated\ HDI = 0.2012 + 0.0076R_{HDI} - 0.00002R^2_{HDI}$. For example, for the 39 countries included in Model 4 the equation provided fairly close HDI estimates, their mean deviation from the actual observations being no more than 0.005.

A positive relationship between human development and income levels as shown in Table 1B is understandable, but part of it can well be attributed to the way the HDI is constructed for the Report. The longevity and education

components of the index are of course likely to be influenced by the level of income. However, the third component, living standard, makes positive correlation between income and human development index all the more inevitable and exaggerated by explicitly according one-third weight to income in the index formula.[12] It is important to keep this fact in view while measuring the impact of other variables on human development using the reported data.

Human development probably is affected not only by the *level* of income alone but also by the *rate* at which income grows. Whether growth in income tends to spur a faster growth in human development or the latter tends to lag behind is an important question to investigate. The data as provided in the Report are hardly tailored to explore the issue. Based on the HDI and the GDP data for the years 1980 and 1995, we have forged a measure of change in human development relative to the change in income for each country depending on the availability of data.[13] We call it the relative change index or the *RCI*. It is obtained by dividing $1+R_H$ by $1+R_G$. The first is equal to the HDI_{1995}/HDI_{1980} and similarly the second is the ratio of the GDP_{1995} to the GDP_{1980}.[14] If the index—expressed as a percentage—for a country is 100, growth in income is proportionate to the growth in human development. If the index is more than 100 human development is faster than the expansion of income, and *vice versa*. The *RCI* has been designed to see if and how, the level of human development R_{HDI} is associated with temporal changes in itself, relative to those in income.

The inequality in the size distribution of income is another factor that may influence the level and pace of human development in a broad way. The income inequality ratio (*IR*) for each country is obtained by deducting from the ratio of the average real GDP per capita of the poorest 40 percent of the population to the average of the richest 20 percent for 1980-94, and multiplying the result by 100. This formulation keeps income inequalities an increasing function of the *IR*.[15]

Finally, expenditure on armament may tend to retard human development, especially in developing countries, by diverting resources from medical care, education, and other welfare promoting measures for the benefit of the poor to the piling up of arms.[16] Most of the military expenditure (*M*), in various countries is competitive, and self-canceling in nature. Peace can doubtless confer on society a dividend in the form of faster human development and improved living, more so for the poor, as the released resources can be utilized for the purpose. We have taken *M* as the mean of each country's military expenditure figures for the years 1985 and 1996, which the Report provides.[17]

Thus, in the following multivariate regression analysis we shall evaluate the extent and direction of the effect on human development (R_{HDI}) of such varied factors as income level (R_{GDP}), rate of human development relative to change in income (*RCI*), the expenditure on military (*M*), and the inequalities in income distribution (*IR*), the last three variables being *percentages*. The analyses presented are based on varying samples of countries, which have

not been selected, as one would like, according to some predetermined technique to ensure randomness in selection. Yet, the samples used are in no way based on any deliberate inclusion or exclusion of countries for any model. In fact, the selection has been random in one sense. We have included in each case countries on the criterion of the availability of the required data in the 1998 Human Development Report. The R_{HDI} and R_{GDP} in the following samples remain the same for the countries included as in the population. Regression analysis based on cross sectional data may not generally be open to the problem of autocorrelation, but may not always be free of its presence. Therefore, the Durbin-Watson statistic, *d,* is provided as a check.

In fact, typical of analyses based on cross sectional data such as the present one, is the issue of non-consistent error variance or *heteroscedasticity* which nullifies a basic assumption of the classical linear regression model that disturbances entering the population regression function are all of uniform variance or *homoscedastic.* The presence of heteroscedasticity in cross sectional data is more a matter of fact than of exception as they invariably comprise of non-uniform units. Thus, in our case countries with low, middle, and high incomes are all sampled together.

However, despite heteroscedasticity, the ordinary least square estimators remain linear, and unbiased. Only, they no longer stay efficient, i.e., they violate the minimum variance requirement. Since our aim here is to estimate the parameters for measuring the impact of certain factors on human development, and not to test hypotheses per se, the possible heteroscedasticity in the data may not be of much consequence to the work. Still, we shall investigate the problem using the Park Test for our key models and provide transformations, if needed. To begin with, we do not find heteroscedasticity affecting Model 1 results: the t-value is 1.350 and its p-value is 0.179.

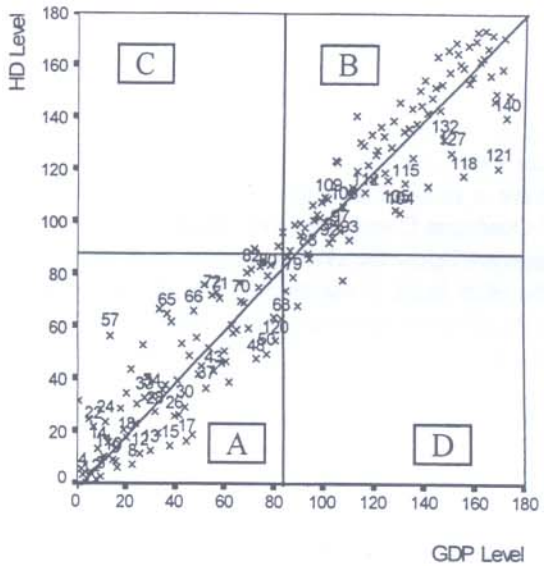
3. RESULTS AND ANALYSIS

3.1 OVERALL PICTURE

The superiority of cubic estimation of the relationship between the level of human development (R_{HDI}) and the level of income (R_{GDP}) over the linear one as indicated earlier, points to an interesting finding. In general, countries with low income levels seem to make greater efforts to develop human resources compared to those with higher income levels. However, they tend to relax on approaching the average level of income, and the human development rates eventually tend to lag behind the rising level of prosperity. The position of Muslim countries in the matter is hardly different. A few related aspects of the relationship may be of interest.

In a diagram as in Figure 2, the points for individual countries along the diagonal would show the equality of human development and income levels,

FIGURE 2
Relative Performance of Countries in Human Development



while the location and distance of points away from the diagonal would reflect their performance. The scatter diagram has been divided into four quadrants A, B, C and D by using the lines for the identical averages (87.5) of the two variables. Here, as in succeeding diagrams, the points bearing value labels for the R_{HDI} show the position of Muslim countries.

All countries lying above the diagonal show a better performance in developing human resources irrespective of their income levels in comparison to those which lie below the diagonal. There are more countries (101) lying below the diagonal than on or above it (73), showing that human development in the population tends to be lower than the level of income. This is probably because a sizable portion of income is spent on heads such as arms and wars, advertising and sales management, exploration of space, or on projects which are not all or entirely related to the promotion of human welfare.

It may be noted that most of the high-income countries lie above the diagonal line, while the bulk of developing low income countries lie below it. This explains in part why the cubic curve provides a better fit to the data. Since most of the Muslim countries (52) fall in the latter category, it is understandable that the majority of them, i.e., 35 are located below the line, while the remaining (17) are located on or above it.

Let us analyze each of the quadrants separately. Quadrant A consists of the countries whose levels of human development and income are no more than the average. Therefore, the effort of those located above the diagonal is

laudable; their level of human development is higher than their income level, despite the latter being in the lower category. Of the 35 Muslim countries in this quadrant, fourteen are on or above the diagonal, showing a good performance.[18] In quadrant B are the countries with higher than average levels of human development and income. The concentration above the diagonal consists of largely high income countries, and there is a much larger dispersion of points below it, as countries from lower income groups tend to move up into the area. Seventeen of the Muslim countries appear here. All of them, with the exception of one, lie below the diagonal, showing that richer Muslim countries have a rather lukewarm approach to improving their human resources.[19] Quadrants C and D are very scantly dotted. In C, we have cases where incomes are below the average while human development is of a high order. On the other hand, D shows countries whose income levels are high but their levels of human development are below average. Such cases where there is a strong positive correlation between the variables R_{HDI} and R_{GDP} are exceptional.

We may now have a look at the nature of relationship between the level of income, R_{GDP}, and the rate of relative change in human development, *RCI*. The relationship is linear and negative as indicated by the results of Model 2, based on a sample of 94 countries.

Notice that in the average *RCI* (112.64 percent) is above the equality line (100 percent) and the majority of countries lie above the average. Also, among them are mostly lower-income developing economies with a fair sprinkle of Muslim nations; they seem to have diverted relatively larger portions of rising incomes to enhancing human resource development.[20] However interestingly, the countries do not depart from the earlier noted overall tendency of relaxing on the human resource development: as their income levels rise, the growth in HDI relative to that in GDP falls along the regression line. The tendency probably increases all the more in the case of Muslim countries as they appear more widely dispersed around the line.

Another variable included in our model is *IR* or the inequality ratio. How human development is influenced by the extent of inequalities in the size distribution of income in a *ceteris peribus* framework is an important issue to examine. The unreported results based on a sample of 50 countries show that the relationship between the variables is positive though negligible, the R^2 being merely 0.055 and its adjusted value no more than 0.036. However, both F and b_1 (0.643) are surprisingly significant at the 10 percent level. The case of Muslim countries shows no material departure from the overall results.

Lastly, M in our list shows the mean of military expenditures as a percentage of the GDP. Taken in isolation of other variables, the level of human development R_{HDI} rises as M increases. The positive relationship between the two apparently defies the contention of the Report, that expenditure on arms is a drag on human development. However, the positive correlation between them looks spurious. The coefficient r (unreported) is very small and insignificant. Also, the Durbin-Watson statistic being much smaller

TABLE 2A
Model 2: Descriptive Statistics

Variable	Mean	Standard Deviation	*N*
RCI	112.44	39.47	94
R_{GDP}	93.39	54.11	94

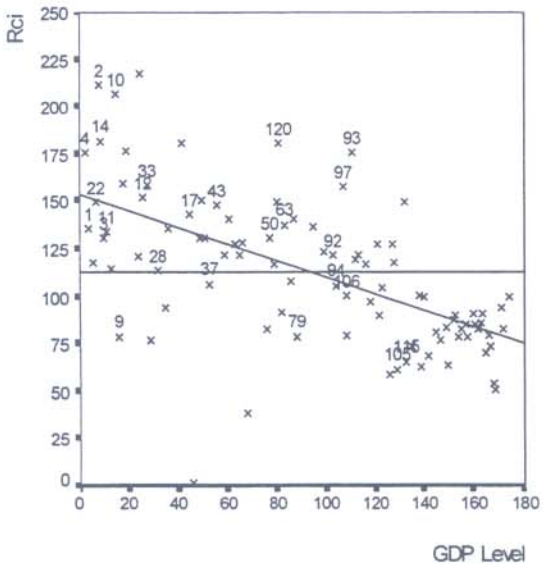
TABLE 2B
Model 2: Regression Results

Independent Variable (b_1): GDP Level

	b_0	b_1	R^2	Adj. R^2	d.f.	*F*	Durbin-Watson
Dependent Variable: *RCI*	151.133	-0.436	0.357	0.350	92	51.01	2.232
t-values	(23.29)***	(-7.14)***					
Significance	(0.00)	(0.00)				(0.00)	(0.000)

Note: *** Significant at the 1 percent level.

FIGURE 3
The Mean of *RCI* and Its Regression on GDP Level



than even the value of the lower bound of the statistic indicates that the results are beset with the problem of autocorrelation.

3.2 FINAL MODELS

We may now put the pieces of our analysis together to assess the role of each explanatory variable in the totality of the issue under discussion. It may be prefaced with a small, but important observation: for variable construction, the Human Development Report does not provide in certain cases, data of all the 174 countries it deals with. Often the needed figures are available only of the developing economies, and that too not of the same set of countries in each case. The data availability of Muslim countries, especially, leaves important gaps probably because of non-compliance.[21] The following analysis is based on data from amongst 153 developing economies.

We begin with the inclusion of three predictors in the model: R_{GDP}, *RCI*, and *M*. The results are shown in Tables 3A, 3B and 3C.

TABLE 3A
Model 3: Descriptive Statistics

Variable	Mean	Standard Deviation	N
R_{HDI}	68.56	45.49	70
R_{GDP}	71.68	44.83	70
RCI	121.61	40.61	70
M	3.02	2.53	70

TABLE 3B
Model 3: Correlation Coefficients

	R_{HDI}	R_{GDP}	RCI	M
R_{HDI}	1.000	0.964 (0.000)	-0.473 (0.000)	0.097 (0.212)
R_{GDP}		1.000	-0.479 (0.000)	0.176 (0.073)
RCI			1.000	-0.505 (0.000)
M				1.000

Note: Figures in parantheses show significance level (one-tail test).

TABLE 3C
Model 3: Regression Results

	Constant	R_{GDP}	RCI	M
Est. R_{HDI}	15.268	0.962	-0.081	-1.907
t-values	(1.876)*	(26.928)***	(-1.809)*	(-2.962)***
Tolerance		0.765	0.588	0.739
VIF		1.308	1.702	1.351

$F = 329.949$ $R^2 = 0.937$ Adj. $R^2 = 0.935$ $d = 1.533$ du (at .01) = 1.546

Note: ***Significant at the 1 percent level; *significant at the 10 percent level (one-tailed test).

M and R_{GDP} are, as expected, positively related: the coefficient r (0.176) albeit low is significant at the 10 percent level. But interestingly, the correlation between R_{HDI} and M is also positive, even if it is smaller (0.097) and insignificant. The real nature of the relationships is unfolded when we put them both in the multiple regression equation along with another explanatory variable, *RCI*, discussed earlier. Notice that the sign of regression for M is negative. Its magnitude too is fairly large (-1.907) and significant, thus confirming that increase in expenditure on arms in the developing economies tends to retard human development.

The last two rows of the summary results providing collinearity statistics show that even though multicolliearity is present in the regression, its degree is not too serious to take note of. Thus, we may bring in our last variable, the inequality ratio, *IR*, to have the final picture. The sample is reduced to 39 countries because of the non-availability of data. The results are produced in Table 4D.

The results of Models 3 and 4 (Tables 3C and 4D) are hardly comparable with reference to the magnitudes of their parameters as the two samples differ considerably in coverage and composition of elements. Still, important is the fact that they do not contradict, rather they reinforce each other's conclusions. Notice that with the addition of *IR* in model 4, the signs of the regression coefficients remain unchanged, but all of them have become more significant. The coefficients of correlation between M and the level of human development (R_{HDI}) and that of income (R_{GDP}), though now smaller and grossly insignificant, still remain positive. Nevertheless, the regression coefficient for M has not only again turned negative, it has also increased in size and stayed significant. It indeed is interesting to find that increases in income inequalities, unlike the rise in military expenditure, go with higher levels of human development *via* the income link. In fact, this seems to confirm Kuznets' celebrated, though controversial, inverted-U hypothesis that income inequalities tend to increase with a rise in income before they begin to fall in developing economies.[22] Similarly, in the present case, the coefficient of correlation between *IR* and R_{GDP} is positive and significant. Multicollinearity

TABLE 4A
Model 4: Descriptive Statistics

Variable	Mean	Standard Deviation	*N*
R_{HDI}	67.31	38.87	39
R_{GDP}	69.27	37.59	39
RCI	118.71	39.95	39
M	2.93	2.01	39
IR	77.10	13.13	39

Table 4B
Model 4: Correlation Coefficients

	R_{HDI}	R_{GDP}	*RCI*	*M*	*IR*
R_{HDI}	1.000	0.949 (0.000)	-0.374 (0.009)	0.013 (0.489)	0.282 (0.041)
R_{GDP}		1.000	-0.327 (0.021)	0.072 (0.331)	0.211 (0.099)
RCI			1.000	-0.624 (0.000)	-0.004 (0.490)
M				(1.000)	-0.063 (0.352)
IR					1.000

Note: Figures in parantheses show significance level (one-tail test).

TABLE 4C
Model 4: Analysis of Variance

	Sum of squares	d.f.	Mean Square	*F*	Significance
Regression	53351.90	4	13338.000	111.688	(0.000)
Residual	4060.36	34	119.422		
Total	57412.30	38			

TABLE 4D
Model 4: Regression Results

	Constant	R_{GDP}	*RCI*	*M*	*IR*
Est. R_{HDI}	15.560	0.912	-0.182	-3.131	0.251
t-values	(1.024)	(17.587)***	(-2.983)***	(-2.730)***	(1.807)*
Tolerance		0.827	0.530	0.590	0.949
VIF		1.210	1.885	1.698	1.054

$R^2 = 0.929$ Adj. $R^2 = 0.921$ $d = 1.933$ du (at .05) = 1.722

Note: ***Significant at the 10 percent level; *significant at the 1 percent level.

here also is not a serious problem, and the model is entirely free of autocorrelation. The Park Test where we regress the residuals on estimated values for R_{HDI} after necessary transformations shows the absence of heteroscedasticity in the model. The *t*-value for the coefficient of R_{HDI} is 1.007, with a *p*-value of 0.321.

3.3 POSITION OF MUSLIM COUNTRIES

The 52 Muslim countries that appear in our study exhibit the same relationship between levels of human development and income as in the population noted earlier. Here, also, the cubic estimation provides a better fit to the data than the linear one as the regressions in Table 5B show.

The similarities between the cubic estimation in Models 1 and 5 are striking, but there are a few notable points of departure as well. Here the superiority of the cubic estimation over the linear regression is more pronounced though the *F*-values in both cases are equally significant: the two *R*-squares differ by 0.005 for the population, while the difference for Muslim countries is 0.08. Again, in the two cubic estimations the value of b_0 is smaller, while that of b_1 is larger (almost double) in the latter case. It means that Muslim countries at higher levels of income are even less conscious to invest resources in human development compared to other countries. This becomes evident from the faster decline in the slope of the curve as income levels move farther beyond the point of inflection in Figure 4.

FIGURE 4
The Relationship Between R_{HDI} and R_{GDP} in the Case of Muslim Countries

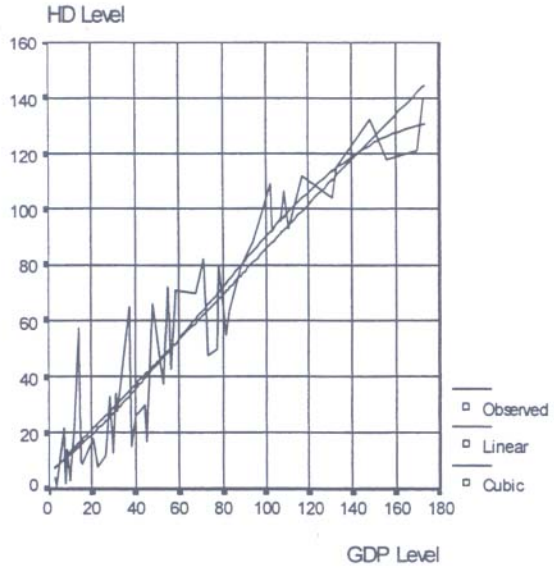


TABLE 5A
Model 5: Descriptive Statistics

Variable	Mean	Standard Deviation	*N*
R_{HDI}	58.16	41.60	52
R_{GDP}	65.93	48.65	52

TABLE 5B
Model 5: Regression Results

Independent Variable: R_{GDP}

Dependent Variable	b_0	b_1	b_2	b_3	R^2	d.f.	F	Significance
Linear Estimation								
R_{HDI}	5.0618	0.8054			0.887	50	393.45	0.000
Cubic Estimation								
R_{HDI}	6.0999	0.5715	0.0052	-3E-05	0.895	48	136.19	0.000

The relationship between *RCI* and R_{GDP} for Muslim countries, similar to those in Model 2, is negative and statistically significant; the slope of the regression line increases slightly (0.441>0.436) even as the sample size reduces from 94 to 26. The results are given in Model 6 (Table 6B).

The results bring to light some interesting facts. Consider the ratio of the *RCI* mean to that of R_{GDP}. This ratio for the 26 Muslim countries at 2.5 is over twice of 1.2 of the 94 countries included in the overall picture presented in Model 2. The gap implies that during the period 1980 to 1995, Muslim countries have possibly been diverting relatively larger proportions of their income increments to improving their human resource. The efforts of many of these countries, being among the poorest in the world, are noteworthy. Notice as further evidence that in Figure 5 all these countries, except four have *RCI* values of more than the 100 benchmark. However, as we move to the right beyond the population's average level of income, i.e., 87.5, we find that for the richer Muslim countries, the values of the *RCI* tend to taper off to even below the benchmark figure.

FIGURE 5
The Relationship Between *RCI* and the Level of Income, R_{GDP}, for 26 Muslim Countries

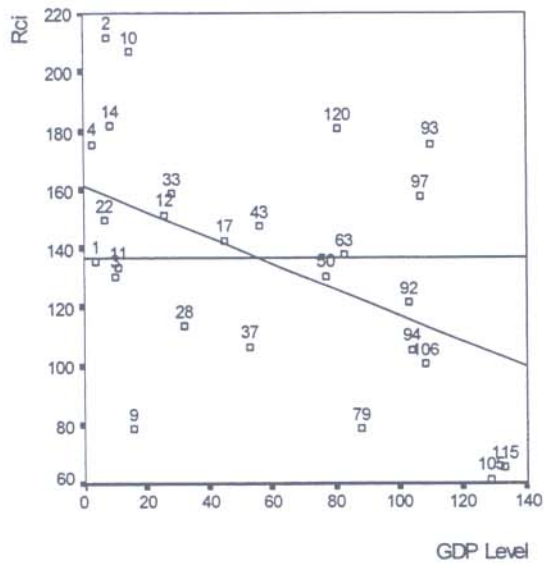


TABLE 6A
Model 6: Descriptive Statistics

Variable	Mean	Standard Deviation	*N*
RCI	136.54	40.19	26
R_{GDP}	55.65	44.34	26

TABLE 6B
Model 6: Regression Results

Independent Variable: R_{GDP}

Dependent Variable	b_0	b_1	R^2	Adj. R^2	*F*	Durbin-Watson
RCI	161.090	-0.441	0.237	0.205	7.449	2.702
t-values	(14.111)***	(-2.329)**				

Note: ***Significant at the 10 percent level; **significant at the 5 percent level.

Introducing *RCI* and *M* into the picture reduces the number of cases in the sample to 25. However, the coefficients retain their signs even though some of them no longer remain significant. The results incorporating the two variables are presented in Model 7 (Table 7D).

It is to be noted that the average military expenditure (*M*) as a percentage of GDP for the Muslim countries in the sample is higher than for the countries in both Models 3 and 4 as presented earlier. Despite the large unproductive diversion of meager resources, their relative change index (*RCI*) remains much higher. However, even as larger proportions of increases in income are being used to improve human resources, the enormity of the initial backwardness in the matter leaves them currently at a lower average in the levels of human development compared to their income levels.

The addition of the remaining explanatory variable, the income inequality ratio or the *IR*, to the model makes the sample of Muslim countries all the more smaller. Due to the non-availability of data, the number is reduced to no more than 13 countries. Almost all the regression coefficients of the sample are found to be highly insignificant, though the direction of relationships remains unaltered. Interestingly, the correlations mostly remain significant. The production of detailed results for the model does not seem to be of much value. The *IR* values are available for seventeen Muslim countries. Their mean is 73.5 percent as compared to 78.7 percent for the 33 non-Muslim countries in the developing world of which data were available. This seems to imply that inequalities in the distribution of income are probably at a lower level in Muslim countries compared to others.

4. SUMMARY AND CONCLUDING REMARKS

We had set out in this paper to explore how the level of human resource development (R_{HDI}), an imperative for poverty alleviation in the developing economies, is affected by the level of income (R_{GDP}), improvement in human development relative to that in income *RCI*, expenditure on military (*M*), and distributive inequalities (*IR*). The study also paid special attention to the position of Muslim countries. Our main findings briefly are as follows.

Human resource development (R_{HDI}) is an increasing function of the level of per capita income (R_{GDP}). Part of the reason for the strong relationship the two variables exhibit is, as we have seen, the in-built income bias in the UNDP's method of constructing the HDI. That aside, it is interesting to find from Table 8 below that the relationship has been gaining strength with the passage of time. What can explain this phenomenon? A plausible explanation could be the rise over time in the awareness of the benefits of investing in human beings as a resource.

TABLE 7A
Model 7: Descriptive Statistics

Variable	Mean	Standard Deviation	N
R_{HDI}	44.92	38.45	25
R_{GDP}	53.60	43.98	25
RCI	135.68	40.78	25
M	3.81	3.35	25

TABLE 7B
Model 7: Correlation Coefficients

	R_{HDI}	R_{GDP}	RCI	M
R_{HDI}	1.000	0.974	-0.542	0.550
		(0.000)	(0.003)	(0.002)
R_{GDP}		1.000	-0.530	0.571
			(0.003)	(0.001)
RCI			1.000	-0.590
				(0.001)
M				1.000

Note: Figures in parantheses show significance level (one-tail test).

TABLE 7C
Model 7: Analysis of Variance

	Sum of squares	d.f.	Mean Square	F	Significance
Regression	33536.70	3	11236.30	133.079	0.000
Residual	1444.60	21	84.43		
Total	34981.30	24			

TABLE 7D
Model 7: Regression Results

	Constant	R_{GDP}	RCI	M
Est. R_{HDI}	5.846	0.844	-0.044	-0.320
t-values	(0.552)	(15.539)***	(-0.736)	(-0.428)
Tolerance		0.617	0.596	0.560
VIF		1.623	1.677	1.787

$R^2 = 0.950$ Adj. $R^2 = 0.943$ $d = 2.50$ du (at .05) = 1.656

Note: ***Significant at the 1 percent level.

TABLE 8
Correlation Between R_{HDI} and R_{GDP} over the Period 1960-1995

	1960	1970	1980	1992	1995
Number of countries	95	97	101	106	174
r	0.872	0.885	0.902	0.929	0.965
% Increase in r	—	1.6	1.9	3.0	3.8

The positive relationship between R_{HDI} and R_{GDP} has another aspect. Its best presentation is provided not by the linear fit to the data but by the cubic estimation of the stretched S, suggesting that countries with low incomes in earlier stages of development tend to pay increasing attention to human resource development up to a stage. However, they seem to increasingly relax in the effort with further improvements in per capita income. Investments in human resource tend to assume diminishing importance even earlier in Muslim countries as they approach higher income brackets.

Distinct from the position at *a point of time*, do economies divert general resources to human development in a lesser proportion than additions to income even as they grow *over the years*? Taking the situation as a whole, the answer seems to be in the affirmative. *RCI*, the relative change index, has a significant inverse correlation with both R_{GDP} and R_{HDI}. A discerning reader will note that Figures 3 and 5 are in fact three dimensional: the movement of points labeled therein with R_{HDI} values for Muslim countries can be interpreted not only with reference to the x-axis, but also with reference to the y-axis. Since both figures are dominated by developing countries, though in varying degrees, a majority of them lie above the threshold level of 100 percent.

Military expenditure unmistakably has a negative impact on human resource development in the lower income nations. The diversion of resources to this unproductive use in Muslim countries has especially been alarming: over the 1985 to 1996 period, the average for them at a little less than 4 percent of their GDPs is much higher than for all the developing countries taken together. The value of peace promotion in this regard can hardly be over emphasized.

Inequalities in the distribution of income tend to go with higher levels of human resource development. One possible reason for this could be that increase in disparities may compensate for the increased disadvantages of the poor by enabling the rich to add even more to their capabilities as they could use the resources better. For Muslim countries, the relationships of *IR* with other variables are found to be highly insignificant. This may be because of the small sample, with just 13 cases which could be combined with those available for other variables in a multiple regression model.

Model 4 has a key position in our analysis, for it does not leave out any of the selected variables. In addition, all the regression coefficients are

statistically significant. The countries in the sample are a good mix of developing economies, including the Muslim countries. For these reasons the inferences which have been or can be drawn from the model are of significance.

The mean values and the number of cases for which data were available for each individual variable in the case of developing economies are given in Table 9. It may be noted that the mean of R_{HDI} for all the developing economies

TABLE 9
Mean Values for Developing Countries

Countries	R_{HDI}	R_{GDP}	*RCI* (%)	*M* (%)	*IR* (%)
All	98.00 (153)	96.92 (153)	111.94 (94)	3.02 (70)	76.93 (50)
Muslim	58.16 (52)	65.93 (52)	135.68 (26)	3.81 (25)	72.84 (16)

Note: Figures in parantheses show the number of observations (*N*).

is higher than the mean of R_{GDP} showing relatively more effort at human resource development. The position is just the reverse for Muslim countries even as both the means in their case are much lower than the overall averages. The higher mean of *RCI* for them is in line with our earlier result that the lower the income level of countries, the higher is the diversion of their incremental incomes to human development. The mean for *M* is at a higher level for the Muslim countries. The inference is obvious. However, the smaller average for the *IR* suggests that income inequalities in Muslim countries are possibly of a lower order. This conforms well with our findings in an earlier work.[23]

The models presented in this study are all free of autocorrelation and heteroscedasticity. Multicollinearity was found to be present, but not of much consequence. The models help formalize perceptions about relationships between our variables, and lend them in the process a scientific status. The results are more than robust to suggest that measures to alleviate poverty would only be scratching the surface until we change the production structures, reallocate resources, and curb the increasing income inequalities to benefit the deprived; human development is yet to enter into many aspects of policy designing and action frameworks.

We have referred to the importance of non-economic factors in human resource development for poverty reduction at the very outset, but restricted the discussion in this paper to the material ones mainly for two main reasons. First, the quantification of moral, ethical, and religious aspects of the matter is considered extremely difficult if not impossible. Second, in a comparative

study, as the present one was intended to be, the considerations for human development issues in mainstream economics do not usually incorporate into model construction variables that cannot somehow be measured. We wish to reiterate that in improving human resources it is not only food, clothing, medical care, education and training that matter, but equally if not more important are such non-measurable variables as culture, tradition, religion, social fragmentation or cohesion, efficiency of administration, political structures, power groups, and the extent of social commitment to improve the lot of the poor. The omission of these considerations is an acknowledged limitation of the present work. Its contribution may largely be sought, among others, in methodological variations it uses, in the relative impact of certain factors on human development that it quantifies, and in the comparative position of the Muslim countries that it seeks to present.

ENDNOTES

1. Quoted in Meier (1995, 265). Significantly, Islam too put special emphasis on acquiring knowledge, and highlights the Divine wisdom in making natural resources in such a mould that they would readily submit to exploitation by human beings for their benefit.

2. Johnson (1964, 221).

3. "The decisive factors of production in improving the welfare of poor people are not space, energy, and crop land, the decisive factor is the improvement in population quality," said Theodore Shultz, in accepting his Nobel prize. Quoted in Meier (1995, 265).

4. See Johnson (1964, 222-3).

5. For example, the classical Islamic scholars adopted this sort of holistic approach in their writings in describing the social system of Islam, and much of the foundation material for Islamic economics still emanates from their all encompassing analyses. However, their works, albeit brilliant in their content, range, and depth, lack the sharp focus, and formal rigor of modern formulations in social sciences, including economics.

6. For example, see UNDP (1998, 107) for the method of constructing the HDI.

7. The 1998 Report takes, for example, Atkinson's formula without justifying its efficacy. It does not say why the adjustment should be made in the first place. It also fails to take note of the impact on the HDI when a distinction is made between the treatment of the countries above the threshold income and those below it, especially on the variance of the index. Last but not least, it is not clear if the Report makes use of adjusted per capita income for the richer countries in providing the income rankings in its key in Table 1. Probably, it uses actual income figures for the purpose.

8. For example, based on the 145 observations each for the HDI and the GDP,

which Table 5 of the Report provides for 1995, the variance for the former is 0.22237^2, while for the latter it is as high as 6384.25^2. How large differences in the variable variances vitiate regression analysis is common knowledge but one may, for example, refer to Jackson (1991, 64) Section 3.3.1.

9. One difficulty in using actual observations, irrespective of the curve fit type, is that the per capita GDP figures are not available for 29 of the 174 countries in the population, among them no less than eleven being Muslim countries. The GDP ranks are provided for all, thus making maximum possible data available for the Muslim countries. In fact, we compared the results of our main models with those obtained through logarithmic transformation of the observed values for the same sets, and found them confirming our results, with the difference that more coefficients became insignificant and were marred by the presence of autocorrelation.

10. Replacing the original values with their ranks confers the stated advantages for regression analysis at some cost in terms of the accuracy of the results compared with the usual method, as it does not utilize all the information the data contain. Nevertheless, it may be mentioned that under certain conditions, r and R_K would be the same. For example, if the first differences of the original values in each series arranged in order of magnitude were constant, the two results would coincide. Again, even where such differences were not constant but the values were normally distributed, a correction could be applied, though not always, to R_K which would equate it with r (see Croxton et al., 1982, 415-6, and the discussion in Taylor (1964, 872-80, whom they also quote).

11. The ratio estimates have been expressed in percentages for that reason such that they, together with the ranks, are well spread over the 1 to a little more than 200 range.

12. One evidence is that if we take the income component out of the HDI for 1995, the average for the remaining two components—longevity and education—has a much reduced R^2 with R_{GDP}, i.e., 0.667 as compared to 0.883 for the full index. However, we have not used the netting in our work for it was found to create other problems.

13. An interested reader can find the names of the countries for which the data was available from the Appendix.

14. In these formulations, R_H is the rate of growth in the HDI over the indicated period corresponding to R_G, the rate of growth in the GDP of a country. The addition of one in each case does not change their variances, but provides the advantage of keeping the values of the variable positive.

15. Here, the deduction of the ratio from 1 makes the income inequality ratio (IR) a direct function of inequalities in the distribution of income without affecting its variance. The formulation implies that if per capita income of the poorest 40 percent in a country equals that of the richest 20 percent, the extent of income disparities in the economy is considered tolerable, if not allowable.

16. See Chapter 3 of the 1994 HDR. It provides an interesting analysis of the adverse

impact of expenditure on armament on human development, and makes, among others, the pertinent suggestion for regulating the sale of arms possibly through some international agency.

17. The calculations are based on figures available in Table 19 of the 1998 HDR.

18. These are Kazakhstan, Maldives, Turkmenistan, Uzbekistan, Albania, Kyrgystan, Azerbaijan, Tajikistan, Comoros, Yemen, Madagascar, Malawi, Guinea-Bissau, and Mali. Their mean R_{HDI} is 48 while their mean R_{GDP} is much lower at 36. Notice that they include either the countries from the erstwhile Soviet Union or mostly the poor African nations.

19. The only exception is Lebanon.

20. Notice that of the Muslim countries with more than the average per capita income ranks, Syria, Saudi Arabia, Turkey, and Malaysia have human development ranks lower than the mean *RCI*, or even lower than the benchmark 100, showing relatively lower priority to human resource development to spending on other heads. Check, for example, their mean expenditures on the army.

21. Among the Muslim countries for which the data in world development reports is especially scanty are Brunei, U.A.E., Kuwait, Saudi Arabia, Iraq, Iran, Jordan, Yemen, Turkey, Libya, Algeria, Oman, Albania, Madagascar, and Mozambique. In most of the remaining cases too, there are some serious gaps. The Islamic Development Bank (IDB) or the Organization of Islamic Conferences (OIC) will be rendering a great service in promoting worthwhile research for the socio-economic development of the *Ummah* if they take up urgently the task of collecting and making available statistical information on vital aspects of the Muslim economies. Even supplying the information asked for by international organizations would go a long way in filling these acute information gaps.

22. It is the left leg of the inverted-U along which are located most of the developing economies showing increasing income inequalities as per capita income starts rising as development gets underway. For brief comments on the hypothesis, one may refer to Meier (1995, 20-2).

23. See Hasan (1997, 30, n. 34).

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APPENDIX

Serial No.	Name of Country	R_{HDI} Ranks	R_{GDP} Ranks	*RCI* %	*M* %	*IR* %
1.	Canada	174	164	91	—	—
2.	France	173	161	85	—	—
3.	Norway	172	167	74	—	—
4.	USA	171	172	83	—	—
5.	Iceland	170	160	91	—	—
6.	Finland	169	152	88	—	—
7.	Netherlands	168	157	85	—	—
8.	Japan	167	165	71	—	—
9.	New Zealand	166	149	84	—	—
10.	Sweden	165	153	90	—	—
11.	Spain	164	145	81	—	—
12.	Belgium	163	163	86	—	—
13.	Austria	162	162	83	—	—
14.	United Kingdom	161	154	79	—	—
15.	Australia	160	155	83	—	—
16.	Switzerland	159	171	94	—	—
17.	Ireland	158	150	64	—	—
18.	Denmark	157	166	80	—	—
19.	Germany	156	159	—	—	—
20.	Greece	155	140	100	—	—
21.	Italy	154	158	79	—	—
22.	Israel	153	147	77	—	—
23.	Cyprus	152	144	—	—	—
24.	Barbados	151	138	101	0.80	—
25.	Hong Kong China	150	169	51	—	77
26.	Luxembourg	149	174	100	—	79
27.	Malta	148	143	—	—	—
28.	Singapore	147	168	54	6.10	—
29.	Antigua & Barbuda	146	130	—	—	—
30.	Korea Rep. Of	145	139	63	4.20	—
31.	Chile	144	135	74	5.65	89

APPENDIX (CONTINUED)

Serial No.	Name of Country	R_{HDI} Ranks	R_{GDP} Ranks	*RCI* %	*M* %	*IR* %
32.	Bahamas	143	146	—	—	—
33.	Portugal	142	141	—	—	—
34.	Costa Rica	141	113	122	0.65	84
35.	Brunei Darussalam	**140**	**173**	—	—	—
36.	Argentina	139	128	118	2.65	—
37.	Slovenia	138	137	—	—	—
38.	Uruguay	137	123	105	2.70	—
39.	Czech Rep.	136	134	—	—	—
40.	Trinidad & Tobago	135	132	150	1.30	—
41.	Dominica	134	119	—	—	—
42.	Slovakia	133	124	—	—	—
43.	Bahrain	**132**	**148**	—	—	—
44.	Fiji	131	115	—	—	—
45.	Panama	130	116	117	1.70	93
46.	Venezuela	129	127	128	1.65	88
47.	Hungary	128	122	90	0.75	82
48.	United Arab Emirates	127	151	—	—	—
49.	Mexico	126	121	128	0.75	—
50.	Saint Kitts & Nevis	125	136	—	—	—
51.	Grenada	124	105	—	—	—
52.	Poland	123	106	—	—	—
53.	Colombia	122	118	98	1.60	87
54.	Kuwait	**121**	**170**	—	—	—
55.	Saint Vincent	120	114	—	—	—
56.	Seychelles	119	125	—	—	—
57.	Qatar	**118**	**156**	—	—	—
58.	Saint Lucia	117	120	—	—	—
59.	Thailand	116	126	59	3.75	79
60.	Malaysia	**115**	**133**	**66**	**4.90**	**83**
61.	Mauritius	114	142	69	1.30	—
62.	Brazil	113	112	120	1.45	—
63.	Belize	112	111	—	—	93
64.	Libya	**111**	**117**	—	—	—
65.	Suriname	110	101	—	—	—
66.	Lebanon	**109**	**102**	—	—	—
67.	Bulgaria	108	100	—	—	—
68.	Belarus	107	96	—	—	—
69.	Turkey	**106**	**109**	**101**	**4.10**	—
70.	Saudi Arabia	**105**	**129**	**62**	**16.20**	—
71.	Oman	**104**	**131**	—	—	—
72.	Russian Federation	103	98	—	—	—
73.	Equador	102	99	124	2.60	80
74.	Romania	101	97	—	—	—
75.	Korea Dem. Peop. Republic	100	92	—	—	—

APPENDIX (Continued)

Serial No.	Name of Country	R_{HDI} Ranks	R_{GDP} Ranks	*RCI* %	*M* %	*IR* %
76.	Croatia	99	89	—	—	—
77.	Estonia	98	93	—	—	—
78.	Iran Islamic Rep.	**97**	**107**	**158**	**2.50***	—
79.	Lithuania	96	84	—	—	—
80.	Macedonia FYR	95	92	—	—	—
81.	Syrian Arab Rep.	**94**	**104**	**106**	**10.60**	—
82.	Algeria	**93**	**111**	**178**	**2.85**	**70**
83.	Tunisia	**92**	**103**	**122**	**3.50**	**74**
84.	Jamaica	91	82	92	0.75	76
85.	Cuba	90	72	—	—	—
86.	Peru	89	87	141	3.20	81
87.	Jordan	**88**	**94**	—	—	**76**
88.	Dominician Rep.	87	86	108	1.10	84
89.	South Africa	86	95	137	2.25	89
90.	Sri Lanka	85	76	83	5.15	50
91.	Paraguay	84	79	117	1.30	—
92.	Latvia	83	75	—	—	—
93.	Kazakhstan	**82**	**71**	—	—	—
94.	Samoa (Western)	81	69	—	—	—
95.	Maldives	**80**	**78**	—	—	—
96.	Indonesia	**79**	**88**	**79**	**2.50**	**57**
97.	Botswana	78	109	80	3.90	—
98.	Philippines	77	66	129	1.70	73
99.	Armenia	76	52	—	—	—
100.	Guyana	75	74	—	—	—
101.	Mongolia	74	85	—	—	—
102.	Ukraine	73	57	—	—	—
103.	Turkmenistan	**72**	**55**	—	—	—
104.	Uzbekistan	**71**	**58**	—	—	—
105.	Albania	**70**	**67**	—	—	—
106.	China	69	68	39	6.80	72
107.	Namibia	68	90	—	—	—
108.	Georgia	67	34	—	—	—
109.	Kyrgistan	**66**	**48**	—	—	—
110.	Azerbaijan	**65**	**37**	—	—	—
111.	Guatemala	64	80	150	1.60	93
112.	Egypt	63	83	138	5.80	58
113.	Moldova Rep.	62	39	—	—	—
114.	El Salvador	61	63	128	3.00	—
115.	Swaziland	60	70	—	—	—
116.	Bolivia	59	65	122	2.10	77
117.	Cape Verle	58	64	—	—	—
118.	Tajikistan	**57**	**14**	—	—	—
119.	Hondorai	56	49	131	1.70	87

APPENDIX (Continued)

Serial No.	Name of Country	R_{HDI} Ranks	R_{GDP} Ranks	*RCI* %	*M* %	*IR* %
120.	Gabon	**55**	**81**	**181**	**1.90**	—
121.	Sao Tome Principe	54	43	—	—	—
122.	Vietnam	53	27	—	—	65
123.	Solomon Islands	52	54	—	—	—
124.	Vanuata	51	60	—	—	—
125.	Morocco	**50**	77	**131**	**4.90**	**71**
126.	Nicaragua	49	46	171	9.50	85
127.	Iraq	**48**	**73**	—	—	—
128.	Congo	47	61	141	1.90	—
129.	Papua New Guinea	46	59	122	1.50	—
130.	Zimbabwe	45	51	131	3.50	87
131.	Myanmar	44	22	—	—	—
132.	Cameroon	**43**	**56**	**148**	**1.90**	—
133.	Ghana	42	50	151	1.20	63
134.	Lesotho	41	29	77	4.80	91
135.	Equatorial Guinea	40	41	—	—	—
136.	Laos	39	62	—	—	52
137.	Kenya	38	36	136	2.70	89
138.	Pakistan	**37**	**53**	**107**	**6.30**	**58**
139.	India	36	35	94	2.90	60
140.	Cambodia	35	21	—	—	—
141.	Comoros	**34**	**31**	—	—	—
142.	Nigeria	**33**	**28**	**159**	**2.60**	**84**
143.	Dem. Rep. Of Congo	32	1	—	—	—
144.	Togo	31	25	218	1.90	—
145.	Benin	**30**	**44**	—	—	—
146.	Zambia	29	18	160	1.50	85
147.	Bangladesh	**28**	**32**	**114**	**1.80**	**50**
148.	Cote de Vore	27	42	181	1.40	69
149.	Mauritania	**26**	**40**	—	—	**84**
150.	Tanzania U Rep of	25	5	—	—	84
151.	Yemen	**24**	**12**	—	—	—
152.	Nepal	23	24	121	1.20	54
153.	Madagascar	**22**	7	**150**	**1.40**	**77**
154.	Central African Rep.	21	19	177	1.90	—
155.	Bhutan	20	33	—	—	—
156.	Angola	19	47	—	—	—
157.	Sudan	**18**	**21**	—	—	—
158.	Senegal	**17**	**45**	**143**	**1.40**	**88**
159.	Haiti	16	13	115	2.50	—
160.	Uganda	**15**	**38**	—	—	**72**
161.	Malawi	**14**	**9**	**182**	**1.10**	—
162.	Djibouti	**13**	**30**	—	—	—
163.	Chad	**12**	**26**	**152**	**2.80**	—

APPENDIX (Continued)

Serial No.	Name of Country	R_{HDI} Ranks	R_{GDP} Ranks	*RCI* %	*M* %	*IR* %
164.	Guinea Bissau	**11**	**11**	**134**	**4.30**	**93**
165.	Gambia	**10**	**15**	**207**	**2.70**	—
166.	Muzambique	**9**	**16**	**79**	**4.20**	—
167.	Guinea	**8**	**23**	—	—	**88**
168.	Eritrea	7	17	—	—	—
169.	Ethiopia	6	2	—	—	—
170.	Burundi	5	6	118	3.60	—
171.	Mali	**4**	**3**	**176**	**1.60**	—
172.	Burkina Faso	**3**	**10**	**131**	**1.80**	—
173.	Niger	**2**	**8**	**212**	**0.70**	**66**
174.	Sierra Leone	**1**	**4**	**136**	**3.50**	—

Notes:

* This figure for military expenditure *M* is treated as abnormal and is not included in deriving results for this work. Figures for *M* are based on the data contained in Table 19 of the 1998 HDR. Figures in bold print are entries for Muslim countries.

1. Ranks for Human Development Index; i.e., R_{HDI} values have been obtained by deducting in each case the rank given in Table 1 of the 1998 HDR from 175 to reverse their descending order to an ascending one.
2. Ranks for real per capita GDP have been obtained by adding real GDP Rank minus HDI Rank given in Table 1 of the 1998 HDR to the HDI Rank the Table provides for each country and deducting the result from 175. The serial numbers in the Appendix indicate the same HDI ranks as in the Report.