



# An empirical investigation of the effects of health and education on income distribution and poverty in Islamic countries

Effects of health  
and education

293

Sadegh Bakhtiari

*Faculty Economic Affairs, Isfahan University, Isfahan, Iran, and*

Hossein Meisami

*Faculty of Islamic Studies and Economics, Imam Sadiq University (ISU),  
Tehran, Iran*

Received August 2009  
Revised September 2009  
Accepted October 2009

## Abstract

**Purpose** – The purpose of this paper is to investigate the effects of health and education on income distribution and poverty in selected Islamic countries.

**Design/methodology/approach** – A model of income inequality along with a model of poverty, with same explanatory variables, are specified. In these models, the main variables are income level, health status, the level of education and the level of savings. The models are estimated using a panel data set for 37 Islamic countries covering eight time periods.

**Findings** – The results show that boosting the health and education status in Islamic countries will reduce income inequality and poverty in Islamic countries.

**Practical implications** – The results of the empirical examination will help governments in Muslim world to identify areas that need to be improved upon in order to reduce income inequality and alleviate poverty.

**Originality/value** – The paper is the first of its kind, which provides empirical evidence that the health and education status is negatively associated with income inequality and poverty in Islamic countries.

**Keywords** Health services, Education, Poverty, Income, Islam, Distribution of wealth

**Paper type** Research paper

## Introduction

A quick glance at the situation of the Islamic countries shows that the present condition in the areas of income inequality and poverty is not satisfactory. Having gone over the international data, one can easily find that the majority of them are developing countries with high levels of poverty and income inequality World Development Report (WDR) (World Bank, 2008). Therefore, it is important for the governments in Islamic countries to find areas that need to be improved upon in order to solve these problems. It seems that quite different suggestions can be presented. One of them is improving health and education status. In other words, it seems that improving health and education in the Muslim world will reduce poverty and change income distribution for better.



**JEL classification** – O12, O15, O50

---

Having gone briefly over the related literature, the present study examines the impact of two components of human capital, health and education, on poverty and income inequality in Islamic countries. The results show that improving the health and education status in Islamic countries will reduce income inequality and poverty. Statistical results of such empirical examination will help governments in Islamic world identify areas that need to be improved upon in order to alleviate poverty and improve the distribution of income.

This paper is organized as follows. In the next section, a selected review of the literature is given. The formulation of a statistical model to be estimated is given in the following section. Statistical results are reported in the subsequent section. The final section comes up with conclusions and presents some policy recommendations.

### Literature review

Considering the 2004 version of the World Development Indicators to investigate the evidence of declining inequality versus economic divergence over the 1980-2002 period, Bourguignon *et al.* (2004) find that inequality is declined, in this period, by most criteria. However, if one takes into account the mobility of countries and the impoverishment of about two dozen countries at the bottom of the distribution, then the evidence points to a worsening of the world income distribution. Taking into account a much longer period (1820-1992), Bourguignon and Morrisson (2002) find a rapid increase in inequality until the Second World War and smaller increases between 1970 and 1992. Most inequality in the early nineteenth century was attributable to intra-country differences while later it was due to inter-country differences. Schultz (1998) estimates that approximately two-thirds of world income inequality since the 1970s is inter-country.

Using a sample of over 3,000 predominantly poor pre-school age children from Ecuador, Paxson and Shady (2005) show that wealth and parental education have a positive impact on their cognitive ability. They also find that child health and measures of parenting quality are associated with better performance on young children's language ability. According to the 2008 WDR, one's opportunities may be affected by either the circumstances of one's birth or membership in groups. Predetermined circumstances affect one's initial endowments in life such as private wealth, the human capital of one's parents, and access to public services and infrastructure. Group membership may cause one to be rewarded differently due to discrimination on the basis of gender, ethnic origin, religious belief, or sexual orientation. Pradhan *et al.* (2003) decompose inequality in health status into within- and between-country inequality and find that within-country variation in standardized height is the source of most inequality rather than differences between countries.

It would be useful to review the literature about human capital components, health and education, more specifically. It is clear that one of the very important components of human capital is education status of a country. In their work, Becker (1962) and Mincer (1958) have approached household choices with respect to education in the same way as how other decisions are made by the household, i.e. they are based on optimization behavior. However, their common assumption that markets for educational loans are perfect is not tenable since human capital cannot be used as collateral with the abolition of slavery. Loury (1981) addresses this constraint when he develops a model with human capital as the only intertemporal good. Behrman *et al.* (1989) empirically show that

constraints in the credit market may be responsible for educational differences. Psacharopoulos (1985) and Schultz (1988) show that the increase in earnings associated with additional education is twice as high in poor countries as in rich countries.

Strauss and Thomas (1995) focus on another component of human capital, i.e. health and nutritional status. They review clearly proves that these are important determinants of productivity and earnings in poor countries. Dasgupta (1993) suggests a model in which he shows that the linkages between nutrition and income lead to a vicious poverty trap. On the other hand, Thomas and Strauss (1997) find that different dimensions of health affect the wages of both men and women in urban Brazil.

Considering and focusing on developed countries, Coulombe and Tremblay (2001) attribute regional convergence of per capita income in Canada for the 1951-1996 period to the convergence process of human capital indicators based on the percentage of the population who have at least a university degree.

### The econometric model

Following Daly (1998), Kawachi and Kennedy (1999), Asafu-Adjaye (2004) and Dao (2004), we can present the statistical model as:

$$Q_{it} = \beta_0 + \sum \beta_{j1} Y_{it-1} + \sum \beta_{j2} H_{it-1} + \sum \beta_{j3} S_{it-1} + \sum \beta_{j4} E_{it-1} + U_{it} \quad (1)$$

where subscript  $i$  refers to a given country and subscript  $t$  is time, with  $t$  values of 1970, 1975, 1980, 1985, 1990, 1995, 2000, and 2005. In this model:

- $Q$  = the income inequality.
- $Y$  = the income level.
- $H$  = the health status.
- $S$  = the level of domestic savings.
- $E$  = the level of education.
- $U$  = an error term.

Considering the foregoing literature review, we hypothesize that income inequality in Islamic countries is affected by previous levels of income, health status, saving, and education. Before going further, we shall present the rationale for selecting these independent variables and discuss how they affect income inequality.

Although the average level of income in an Islamic economy may not be a precise measure of the income inequality, but, by and large, as economies grow, the incidence of inequality may be lessened due to the trickle down effect, which is mentioned in the economic literature (Dao, 2004, pp. 14-20). We thus expect a negative sign for the purchasing power parity gross national income per capita variable.

Education is an important variable because a more literate society has greater awareness of factors affecting health and is therefore better placed to take preventive measures, or seek medical assistance when ill. Considering the fact that better health and education status benefits the poor more than the rich, we can conclude that improving the health and education situation in Islamic countries, will reduce income inequality; as presented in the literature (Brainerd and Cuttler, 2004).

The level of savings in a country is used here as a proxy for the capacity to afford health care. Therefore, we expect a negative association between savings level and income inequality.

Having gone over the inequality matter, it is time to examine how significant the same explanatory variables are in explaining cross-country variations in poverty, using the same sample of Islamic economies. Again assuming that these variables linearly affect poverty in an Islamic country, we can state the following statistical model:

$$P_{it} = \beta_0 + \sum \beta_{j1} Y_{it-1} + \sum \beta_{j2} H_{it-1} + \sum \beta_{j3} S_{it-1} + \sum \beta_{j4} E_{it-1} + U_{it} \quad (2)$$

In this model again, subscript  $i$  refers to a given country and subscript  $t$  is time, with  $t$  values of 1970, 1975, 1980, 1985, 1990, 1995, 2000, and 2005. In this model:

$P$  = the poverty; and is defined as the percentage of the population under the national poverty line.

$Y$  = income level.

$H$  = the health status.

$S$  = the level of domestic savings.

$E$  = the level of education.

$U$  = an error term; just like the previous model.

Here, again our hypothesis is that, the poverty in Islamic countries is affected by previous levels of income, health status, saving, and education. Here, the expected signs and explanation of independent variables are quite similar as the income inequality model.

### Data sources

In estimating the presented models, three alternative measures of income are used: real per capita gross domestic product (GDP) (in 1995 constant US\$), the human development index (HDI), and educational expenditure (percent of GDP). The proxy for income inequality is the Gini coefficient (which is measured from the Lorenz curve). Domestic savings is defined as the proportion of total domestic savings to GDP. Educational level is represented by the ratio of total enrolments in primary school to the population aged between 15 and 65 years of age. After all, the proxy for health status is life expectancy at birth (in years). Estimates of the Gini coefficient are obtained from the World Institute of Development Economics Research's database, estimates for HDI are obtained from the UN's 2008 and 2009 WDR, while the remaining variables are obtained from the 2008 World Development Indicators (World Bank, 2008). To be pointed finally is that in some cases, data are obtained from Annual Economic Report on the OIC countries (Statistical, Economic and Social Research and Training Centre for Islamic Countries, 2008).

The choice of the Islamic countries in the sample was dictated mainly by the existence of a long enough time series for all the variables in the model. A complete data set was obtained for 37 countries[1]. Combined with data for eight time periods for each country, this amounted to 296 observations.

Table I reports summary statistics for the variables used in the analysis. For example, average life expectancy for the sample period for all countries is 67.7 years.

**Methodology of the study**

Because of the different advantages of panel data approach (Baltagi, 1995, pp. 8-13), this method is used in this paper. To choose between pooling and panel, the *F*-test was conducted. This test uses restricted residual sum of squares and unrestricted residual sum of squares to make the following statistic:

$$F = \frac{(RRSS - URSS)/N - 1}{URSS/NT - N - K} \overset{H_0}{\sim} F_{N-1, N(T-1)-K}$$

In this test, *H*<sub>0</sub> supports the idea that the intercepts are equal (pooling). On the other hand, *H*<sub>1</sub> shows that they are not equal (panel). Hence, the rejection of null hypothesis means that the panel approach is superior.

For choosing between fixed effects panel model and random effects panel model, the Hausman (1978) test is used. In this test the statistic is:

$$W = (b_s \beta_s)' (\mathbf{M}_1 - \mathbf{M}_0)^{-1} (b_s - \beta_s)$$

where, *W* has  $\chi^2$  distribution with *R* degrees of freedom. In this case, **M**<sub>1</sub> is covariance matrix for the coefficients of fixed effects model (*b*<sub>s</sub>) and **M**<sub>0</sub> is covariance matrix for the coefficients of random effects model  $\beta_s$ . If **M**<sub>0</sub> and **M**<sub>1</sub> are correlated, *b*<sub>s</sub> and  $\beta_s$  could be statistically different. In Hausman test, *H*<sub>0</sub> confirms the selection of random effects model; while the alternative case, *H*<sub>1</sub>, supports the selection of fixed effects model (Baltagi, 1995, pp. 22-43).

Considering the points stated above, we must use *F*-test to choose between pooling and panel. The calculated *F* is 3.55; which is more than the critical level 1.59 (at 5 percent level of significance) and so the null hypothesis could be rejected; but, to choose between fixed effects and random effects, the Hausman test can be used. The calculated  $\chi^2$  statistic is 14.85; which is well above the critical level 0.411 (at 5 percent level of significance) and so *H*<sub>0</sub> is rejected. It means that the fixed effects model must be used.

**Empirical results**

Table II presents results for the inequality model (estimation of equation (1)). The first set of results (Model 1) shows that lagged income (represented by per capita GDP) has

Variable	Amount
Life expectancy (years)	66.4
Gini coefficient	0.36
Per capita GDP (1995 US\$)	9,164
HDI	0.655
Educational expenditure (percent GDP)	3.5
Domestic savings (percent GDP)	10.4
Adult literacy rate	6.234
Percentage of the population under the national poverty line	33.4

**Table I.**  
Average of variables for 1970-2005

Variable	Model 1	Model 2	Model 3
C	61.3 (32.03)	- 4.71 (27.650)	36.6 (18.783)
$Y_{t-1}$	- 0.0003* (8.941)	- 0.027* (3.460)	- 53.677* (9.522)
$H_{t-1}$	- 0.023 (- 0.924)	- 0.027* (- 2.122)	- 0.026** (1.453)
$E_{t-1}$	- 2.21 × 10 <sup>-77</sup> * (5.188)	- 0.024* (2.555)	- 4.75 × 10 <sup>-8</sup> * (2.170)
$S_{it-1}$	- 0.023 (1.134)	- 0.0007** (1.660)	- 0.004 (0.260)
$R^2$	0.932	0.923	0.953
$\bar{R}^2$	0.911	0.906	0.921

**Table II.**  
Dependent variable:  
income inequality

**Notes:** Significant at \*5 and \*\*10 percent levels, respectively; *t*-ratios are in parentheses; in the first model, income variable is GDP I; in the second model, income variable is education expenditure; in the third model, income variable is HDI

a significant negative effect on inequality. For example, a \$100 increase in per capita income in the previous period decreases inequality by 0.03, holding all other variables constant. On the other hand, the health status has negative effects on inequality as well; despite of the fact that this variable is not statistically significant. Both the level of savings and education have negative effects on income inequality, as hypothesized. However, only the latter is statistically significant.

In the second set of regressions (Model 2), educational expenditure is used as a proxy for income. In this model, both income and health status have a significant negative effect on income inequality. For example, a one-year increase in life expectancy in the previous period reduces the income inequality in the current period by 0.029, holding all other variables constant. The coefficients of savings and education have significant effects on health, as postulated.

In the related literature, per capita income is generally regarded as a narrow measure of economic development (Schultz, 1998, p. 13). Hence, the UN has developed an alternative measure, the HDI, which measures a country's achievements in three aspects of human development: longevity, knowledge, and a decent standard of living. Longevity is measured by life expectancy at birth; knowledge is measured by a combination of the adult literacy rate and the combined gross primary, secondary, and tertiary enrolment ratio; and standard of living is measured by GDP per capita (PPP US\$). The third regression (Model 3) used the HDI as a proxy for income. Here, it can be seen that the coefficient of HDI is highly significant and negative. On the other hand, the health status is also significantly related to income inequality. For example, a one-year increase in life expectancy in the previous period reduces the income inequality in the current period by 0.026, holding all other variables constant. Here, educational level is also significantly positive, but the level of savings is not significant.

Table III presents results for regressions where dependant variable is poverty (estimation of equation (2)). The first set of results (Model 4) shows that income (represented by per capita GDP) and health status have a significant negative effect on poverty. For example, a \$100 increase in per capita income in the previous period decreases poverty by 0.02 percent, holding all other variables constant. On the other hand, a one-year increase in life expectancy in the previous period reduces poverty in the current period by 0.15 percent, holding all other variables constant. In this model, the level of savings is not statistically significant, but the education is. When the

Variable	Model 4	Model 5	Model 6
C	45.27 (4.44)	36.72 (3.15)	223.65 (21.13)
$Y_{t-1}$	0.0002* (6.29)	-4.59* (-2.77)	-51.688* (-2188)
$H_{t-1}$	0.15* (288)	-0.943* (4.88)	-0.113** (1.333)
$E_{t-1}$	$-6.04 \times 10^{-7}$ * (5.187)	$-6.12 \times 10^{-7}$ * (2.543)	$-3.12 \times 10^{-8}$ * (2.145)
$S_{it-1}$	-0.032 (-0.044)	-0.199 (-0.067)	-0.054 (-0.67)
$R^2$	0.856	0.852	0.957
$\bar{R}^2$	0.884	0.834	0.946

**Notes:** Significant at: \*5 and \*\*10 percent levels, respectively; *t*-ratios are in parentheses; in the first model, income variable is GDP I; in the second model, income variable is education expenditure; in the third model, income variable is HDI

**Table III.**  
Dependent variable:  
poverty

income variable is replaced with education expenditure (Model 5), results similar to Model 4 are obtained.

The last set of regressions in Table III represents the case where income is proxied by HDI (Model 6). It can be seen that the effects of health status on poverty is negative, although this is not as strong as in the previous cases. Once again, it can be observed that both the level of savings and education have a negative effect on poverty, although only the latter is statistically significant.

### Conclusion

The present study has examined the impact of the components of human capital, health and education, on the income inequality and poverty rate in selected Islamic countries. A model of income inequality along with a model of poverty, with same explanatory variables, was specified. In these models, the main variables were income level, health status, the level of education and the level of savings. The models were estimated using a panel data set for 37 Islamic countries covering eight time periods.

The results show that improving the health and education status in Islamic countries will reduce income inequality and poverty in Islamic countries. Statistical results of such empirical examination help governments in Islamic world identify areas that need to be improved upon in order to alleviate poverty and improve the distribution of income.

### Note

1. The sample consists of the following OIC Islamic countries: Albania, Algeria, Azerbaijan, Bangladesh, Benin, Burkina Faso, Chad, Côte D'ivoire, Egypt, Gambia, Guinea-Bissau, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Morocco, Mozambique, Niger, Nigeria, Oman, Pakistan, Qatar, Saudi Arabia, Senegal, Sierra Leone, Singapore, Sudan, Somalia, Tajikistan, Turkey, Uganda, United Arab Emirates, Uzbekistan, and Yemen.

### References

- Asafu-Adjaye, J. (2004), "International trade and sustainable development in sub-Sahara Africa", *International Journal of Social Economics*, Vol. 31 No. 4, pp. 417-29.
- Baltagi, B.H. (1995), *Econometric Analysis of Panel Data*, Wiley, Chichester.

- Becker, G.S. (1962), "Investment in human capital: a theoretical analysis", *Journal of Political Economy*, Vol. 70 No. 5, pp. 9-49.
- Behrman, J.R., Pollack, R.A. and Taubman, P. (1989), "Family resources, family size, and access to financing for college education", *Journal of Political Economy*, Vol. 97 No. 2, pp. 398-419.
- Bourguignon, F. and Morrisson, C. (2002), "Inequality among world citizens: 1890-1992", *American Economic Review*, Vol. 92 No. 4, pp. 727-44.
- Bourguignon, F., Levin, V. and Rosenblatt, D. (2004), "Declining economic inequality and economic divergence: reviewing the evidence through different lenses", *Economy International*, Vol. 100 No. 4.
- Brainerd, E. and Cuttler, D.M. (2004), "Autopsy on an empire: understanding mortality in Russia and the former soviet union", National Bureau of Economic Research Working Paper Series No. 10868, National Bureau of Economic Research, Cambridge, MA.
- Coulombe, S. and Tremblay, J.F. (2001), "Human capital and regional convergence in Canada", *Journal of Economic Studies*, Vol. 28 Nos 2/3, pp. 80-154.
- Daly, K. (1998), "Does exchange rate volatility impede the volume of Japan's bilateral trade?", *Japan and the World Economy*, Vol. 10, pp. 333-48.
- Dao, M.Q. (2004), "Rural poverty in developing countries: an empirical analysis", *Journal of Economic Studies*, Vol. 31 Nos 5/6, pp. 500-8.
- Dasgupta, P. (1993), *An Inquiry into Well-being and Destitution*, Oxford University Press, Oxford.
- Hausman, J.A. (1978), "Specification tests in econometrics", *Econometrica*, Vol. 46, pp. 1251-72.
- Kawachi, I. and Kennedy, B.P. (1999), "Income inequality and health: pathways and mechanisms", *Health Services Research*, Vol. 34, pp. 215-27.
- Loury, G. (1981), "Intergenerational transfers and the distribution of earnings", *Econometrica*, Vol. 49 No. 4, pp. 843-67.
- Mincer, J. (1958), "Investment in human capital and personal income distribution", *Journal of Political Economy*, Vol. 66 No. 4, pp. 281-302.
- Paxson, C. and Schady, N. (2005), *Cognitive Development among Young Children in Ecuador: The Roles of Wealth, Health and Parenting*, World Bank, Washington, DC.
- Pradhan, M., Sahn, D.E. and Younger, S.D. (2003), "Decomposing world health inequality", *Journal of Health Economics*, Vol. 22 No. 2, pp. 271-93.
- Psacharopoulos, G. (1985), "Returns to education: a further international update and implications", *Journal of Human Resources*, Vol. 20.
- Schultz, T.P. (1988), "Education investments and returns", in Chenery, H. and Srinivasan, T.N. (Eds), *Handbook of Development Economics*, Elsevier, Amsterdam, pp. 543-630.
- Schultz, T.P. (1998), "Inequality in distribution of personal income in the world: how it is changing and why", *Journal of Population Economics*, Vol. 11 No. 3, pp. 307-44.
- Statistical, Economic and Social Research and Training Centre for Islamic Countries (2008), *Annual Economic Report on the OIC Countries*, OIC Press, New York, NY.
- Strauss, J. and Thomas, D. (1995), "Human resources: empirical modeling of household and family decisions", in Behrman, J. and Srinivasan, T.N. (Eds), *Handbook of Development Economics*, 3A, Elsevier Science, Amsterdam.
- Thomas, D. and Strauss, J. (1997), "Health and wages: evidence on men and women in urban Brazil", *Journal of Econometrics*, Vol. 77 No. 1, pp. 159-85.
- World Bank (2008), *World Development Report 2009: Development and the Next Generation*, Oxford University Press, New York, NY.



---

**Further reading**

- Azariadis, C. and Drazen, A. (1990), "Threshold externalities in economic development", *Quarterly Journal of Economics*, Vol. 105 No. 2, pp. 501-26.
- Chattefuee, S. (2006), *Regression Analysis by Example*, Wiley, Hoboken, NJ.
- Goesling, B. and Firebaugh, G. (2004), "The trend in international health inequality", *Population and Development Review*, Vol. 30 No. 1, pp. 131-46.
- Hamdani, S.N.H. and Ahmad, E. (2002), "Optimizing human resources in Islamic management", *International Journal of Islamic Management*.
- Hamdani, S.N.H. and Shah, A.H. (2006), *Human Resource Management in an Islamic Society*, Izmir University, Izmir.
- Krueger, A.B. and Lindhall, M. (1999), "Education for growth: why and for whom?", *Journal of Economic Literature*, Vol. 14, pp. 1101-36.
- Ljungqvist, L. (1993), "Economic underdevelopment: the case of a missing market for human capital", *Journal of Development Economics*, Vol. 40, pp. 219-39.
- Marshall, A. (1920), *Principles of Economics*, Methuen, London.
- Mincer, J. (1974), *Schooling, Experience, and Earnings*, NBER Press, New York, NY.
- Romer, P.M. (1986), "Increasing returns and long run growth", *Journal of Political Economy*, Vol. 94, pp. 1002-37.
- World Bank (2005), *World Development Report 2006: Equity and Development*, Oxford University Press, New York, NY.
- World Bank (2006), *World Development Report 2007: Development and the Next Generation*, Oxford University Press, New York, NY.
- World Bank (2007), *World Development Report 2008: Equity and Development*, Oxford University Press, New York, NY.
- Yao, S., Zhang, Z. and Fang, G. (2005), "Rural-urban regional inequality in output and consumption in China under economic reform", *Journal of Economic Studies*, Vol. 32 No. 1, pp. 4-21.

**Corresponding author**

Hossein Meisami can be contacted at: [Meisamy1986@gmail.com](mailto:Meisamy1986@gmail.com)