

IMPACT OF HUMAN POVERTY ON THE HUMAN DEVELOPMENT INDEX IN JORDAN WITHIN THE PERIOD 2003 - 2016

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ABSTRACT

Poverty is nowadays story, it is the population speech obtained from the bad socioeconomic activities, and it remains as the main effect on our future, it is present everywhere, but the kind in the Arabs countries after several modern wars is of great magnitude in its spread dimension. Jordan as incubator country of the all Arabs in MENA region and is considered as an intelligent country that living in unfair zoon; and holding all crises people who are seeking better life. Such Arabs problem affect on the level of poverty in Jordan, which is a challenge to move forward and increase the degrees of human development. In this article, we are studying the impact of poverty on the human development in Jordan using a high statistical model. The suggested model is called Error-in-Variables model, which assumes some error in computations of the human development and human poverty indices. The statistical analysis showed that the human poverty has a negative impact on the human development index, which means the decision makers in Jordan should improve their policy and planning strategies to improve the Jordanians life expectancy, educational attainment, and income.

Keywords: Human development index; Human poverty index; Jordan, Measurement Error Models, Maximum Likelihood Estimation.

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1. INTRODUCTION

Poverty as defined by the United Nation (UN) is the inability for an individual to meet the minimum requirements to have a decent standard of living such that the individual remains alive, maintaining his humanity and practice is a daily activities (UN, 2015). "Poverty is pronounced deprivation of well-being. Nevertheless, what precisely is deprivation? The voices of poor people bear eloquent testimony to its meaning (World Bank, 1990). To be poor is to be hungry, to lack shelter and clothing, to be sick and not cared for, to be illiterate and not schooled. However, for the poor, living in poverty is more than this. Poor people are practically vulnerable to adverse events out of their control. They are often treated badly by the institutions of state and society and excluded from voice and power in those institutions (World Bank, 2001). In Jordan, the household

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expenditure and income survey (HEIS) which conducted in (2013) by the department of statistics (DOS) is the main source for measuring poverty. The simple linear regression technique used for measuring poverty food line in Jordan assuming that the dependent variable is the individual's amount of food divided by the individual's average food expenditure and the independent variable is the annual expenditure on food. In general, the poverty line divided the nation into two independent strata (Poor, and Non-Poor). There are several poverty lines including the food poverty line, absolute (income) poverty line, Absolute poverty incidence or the so called head count ratio, poverty gap indicator and poverty severity indicator. Table 1; show the poverty index in Jordan (DOS, 2013). On the other hand, the UNDP has developed a Human Development Index (HDI) and a Human Poverty Index (HPI) for the purpose of cross-country comparison. The HDI is a single statistic proposed to serve as a frame of reference for both social and economic development by combining indicators of life expectancy, educational attainment, and income (Haq, 1995; Sen, 1989). According to the concept of human development, income is a mean and not an end. "The concept mainly focuses on people's long healthy life, people's knowledge, and access to resources needed for a decent standard of living. If these elements are unavailable, many other opportunities remain inaccessible. Further, Human development consists of two main variables namely; human capabilities and skills (UNDP, 1990; DOS, 2010; Pendakur, 2001; Alesina, et al., 2004; Hansen-Bauer et al, 1988).

Table 1: Poverty index in Jordan

	Food	Non-Food	Incidence	Gap Indicator	Severity Measure of poverty's variability)
Poverty Index	336	478	814	176.8	
Poverty% within Jordan	32%	14.4%	14.4%	3.6%	1.21%

The human poverty index (HPI) measures the degree of deprivation in the basic dimensions of human development, specified in the concept of human development. The development objectives according to the concept are the human choice and the favorable environment, which allows the people to have a healthy and creative lifestyle. The main elements of the selection according to the concept are the following three options: (1) an opportunity for a long and healthy life; (2) the ability to acquire knowledge; (3) the ability to access the resources needed to maintain a decent standard of living. (HDI) developed to create an enabling environment for people to enjoy long, healthy, and creative lives (Abukhalil, 1997; Kharabsheh, 2001, Al-Nasser, 2012; Blundell and Preston, 1996).

The rest of the article is organized as follows: The importance of the study is discussed in section 2; the mathematical model is discussed in section.3. The statistical analysis, modeling, and data analysis are given in section.4. The article ends with a practical implications of the main findings section.

2. IMPORTANCE OF THE STUDY

Poverty is considered as one of the major barriers to the development process of any country, and Jordan has no exception. In this article, a structural error in variable model will be used to study the impact of HPI on the HDI. In the process of development, as pointed out by Prathapage (2006) considering regional variables and trying to find solutions and reasons for such kind of variables is a necessary thing. Moreover, according to the United Nation's National Human Development Report (2016), "Jordan's HDI value for 2015 is 0.741— which put the country in the high human development category— positioning it at 86 out of 188 countries and territories. Between 1990 and 2015, Jordan's HDI value increased from 0.620 to 0.741, an increase of 19.6 percent. It is worth to say that; Between 1990 and 2015, Jordan's life expectancy at birth increased by 4.3 years, mean years of schooling increased by 5.0 years and expected years of schooling increased by 1.4 years. Also, the Jordan's gross national income (GNI) per capita increased by 61% from 1990 to 2015.

Therefore, in the case of Jordan, as a country trying very hard to reduce the level of poverty across the regions in question, it will important to policy makers if we can identify causes or problems regarding poor people's, so as to help future planning and implementation process of policies and strategies adopted by the government.

3. THE MATHEMATICAL MODEL

The classical model used to express a simple linear relationship between two variables y and x , is the regression analysis "regression y on x " assuming that only one variable "y" is measured with error. In practical situation, the later assumption vanishes as both variables in data collection observed with error. Accordingly, the classical simple linear Measurement error model (MEM) is a generalization of the simple linear regression that can be used to fit such linear relationships when both variables are measured with error (Kendall and Stuart, 1979; Fuller, 1987; Cheng and Van Ness, 1999; Al-Nasser 2005).

A comparisons study between several regressions models are given by Bagya et al, 2018. In this study, we will consider the regression model when both variables are subject to error. Suppose that we have bivariate sample of size n , then the linear MEM can be formulated by using a two unobserved latent variables ξ and η that have a linear relationship of the form:

$$\eta_i = \alpha + \beta \xi_i, \quad i = 1, 2, \dots, n \quad (1)$$

Where α and β are the intercept and the slope, respectively. To measure such unobserved latent a manifest variables Y and X are used, which can be expressed in two simple additive equations each connected with some error:

$$\mathbf{y}_i = \boldsymbol{\eta}_i + \boldsymbol{\varepsilon}_i \quad \text{and} \quad \mathbf{x}_i = \boldsymbol{\xi}_i + \boldsymbol{\delta}_i \quad (2)$$

Where $\xi_1, \xi_2, \dots, \xi_n$ (or equivalently $\eta_1, \eta_2, \dots, \eta_n$) called "incidental" parameters. δ_i in addition, ε_i are error terms that assumed to be mutually independent and distributed normally with mean $(0, 0)$ and unknown variances (σ^2, τ^2) . The number of unknowns in the MEM is

varying based on the type of this relationship "functional, structural, or ultra-structural." In addition, the presence of the incidental parameter leads to inconsistencies of the estimators. To overcome the inconsistencies of the estimators, one piece of information is required on the MEM (Al-Nasser, 2005, Al-Nasser, 2010; Al-Nasser, 2011, Ciavolino et al., 2015).

3.1. Estimation Methods of MEM

Under normality assumption, the classical Maximum Likelihood Estimators (MLE) of model (1) can be obtained by solving the log likelihood function:

$$\log L(\alpha, \beta, \sigma^2, \tau^2, \xi_1, \dots, \xi_n, \eta_1, \dots, \eta_n) = -n \log(2\pi) - \frac{n}{2} (\log(\sigma^2) + \log(\tau^2)) - \frac{\sum_{i=1}^n (x_i - \xi_i)^2}{2\sigma^2} - \frac{\sum_{i=1}^n (y_i - \alpha - \beta\xi_i)^2}{2\tau^2}$$

Solving the likelihood function is an ill posed problem; therefore the piece of information about $\lambda = \frac{\sigma^2}{\tau^2}$ (or both error variances are known) is essential to obtain consistent estimator *Kendall and Stuart (1979)*. Accordingly, the MLE solution will be

$$\hat{\beta} = \frac{(S_{yy} - \lambda S_{xx}) + ((S_{yy} - \lambda S_{xx})^2 + 4\lambda S_{xy})^{1/2}}{2S_{xy}} \tag{2}$$

$$\hat{\alpha} = \bar{y} - \hat{\beta}\bar{x} \tag{3}$$

And

$$\hat{\xi}_i = \frac{\lambda x_i + \hat{\beta}(y_i - \hat{\alpha})}{\lambda + \hat{\beta}^2} \quad \text{where } S_{xx} = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2, \quad S_{yy} = \frac{1}{n} \sum_{i=1}^n (y_i - \bar{y})^2,$$

$$S_{xy} = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y}), \quad \bar{x} = \frac{\sum_{i=1}^n x_i}{n}, \quad \bar{y} = \frac{\sum_{i=1}^n y_i}{n}.$$

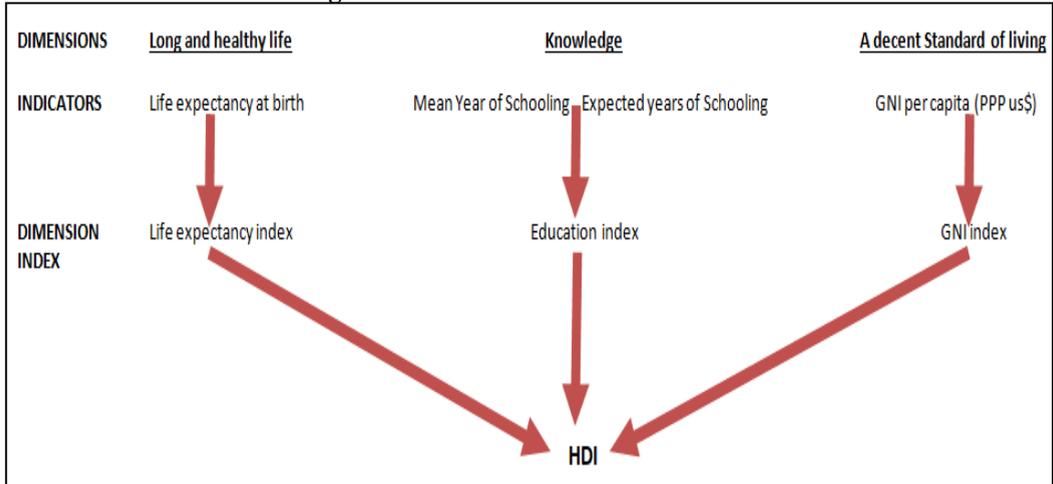
For other solution based on different prior information, refer to Fuller (1987). Other estimation methods that are given in the literature, lately Al-Nasser et al. al (2016) considered an iterative estimation procedure to MEM.

4. THE DATA

A great deal of socio-economic surveys conducted by national statistical offices is designed to provide reliable estimates only at the national (Martinez, 2014). The data in this article consists of measuring two variables in Jordan within the period 2003 - 2016. The first variable is the Human Development index (HDI) which proposed by the united nation program (1990).The HDI is

measured by computing the geometric mean of the three human components (1) the long healthy life, (2) Human knowledge, and (3) Decent standard of living (Figure 1).

Figure 1: HDI Dimensions and Indicators



Source: UNDP 2010

Basically, the dimensional index is computed for each of this component using the following rule:

$$\text{Dimensional Index} = \frac{\text{Actual Value} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}}$$

then the HDI is the geometric mean of the normalized indices measuring achievement in each dimension, which is given by:

$$\text{HDI} = \sqrt[3]{I_{\text{Health}} \times I_{\text{Education}} \times I_{\text{Income}}}$$

The HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. The HDI can also be used to question national policy choices, asking how two countries with the same level of income per person can end up with such different human development outcomes (UNDP, 2015).

The second variable considered in this study is the Human Poverty index (HPI) which was developed by the UN to complement the HDI in 1997. It served as an additional measure of the standard of living in a country. It is worth to say that the UN in 2010 substituted the HPI by the Multidimensional Poverty Index (UNDP, 2013). While, before 2010, the HPI has two forms and each form was computed separately for developing countries (HPI-1) which defined as a composite index measuring deprivations in the three basic dimensions captured in the HDI. The HPI-1 is defined as "" (United Nations, 2008). The formula for calculating HPI-1 is as follows:

$$HPI - 1 = \sqrt[3]{\left(\frac{P_1^3 + P_2^3 + P_3^3}{3}\right)}$$

where P_1 : Probability at birth of not surviving to age 40, P_2 : Adult illiteracy rate and P_3 : unweighted average of population without sustainable access to an improved water source and children who are underweight for their age.

The other form of HPI is for developed countries (HPI-2) which is similar to HPI-1 and defined as a composite index measuring deprivations in the four basic dimensions captured in the HDI and capturing social exclusion. The formula for calculating HPI-2 is as follows:

$$HPI - 2 = \sqrt[3]{\left(\frac{P_1^3 + P_2^3 + P_3^3 + P_4^3}{4}\right)}$$

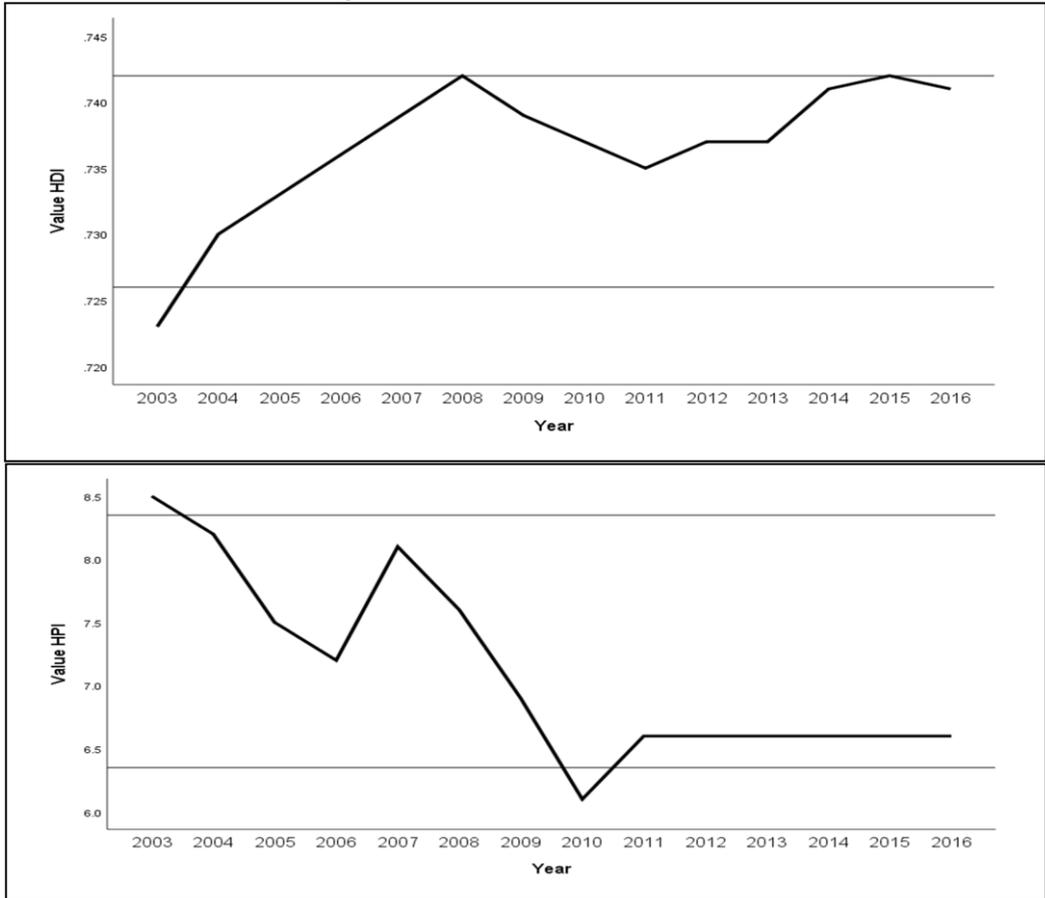
where P_1 : Probability at birth of not surviving to age 60, P_2 : Probability at birth of not surviving to age 60, P_3 : Population below the income poverty line (50% of median adjusted household disposable income) and P_4 : Rate of long-term unemployment (lasting 12 months or more).

The Arabs statistical leagues start to evaluate the HDI few years ago. The HPI and the HDI of Jordan based on aggregated bivariate data that available about both variables which is given in the period 2003 - 2016 and published by the UN official recourses; see the Appendix. The descriptive statistics of these data are given in Table 2:

Table 2: Descriptive Statistics of HPI and HDI in Jordan

	Minimum	Maximum	Mean	Stdev	Median	P10	P90
HPI	.723	.742	.736	.737	.005	.726	.742
HDI	6.1	8.5	7.121	6.750	.7402	6.350	8.350

For better data description, we locate the HPI and HDI within two reference lines P10 and P90, respectively. The line charts given in Figure.2 indicated that Jordan political rules are very active in increasing the human development and decreasing the poverty at the same time.

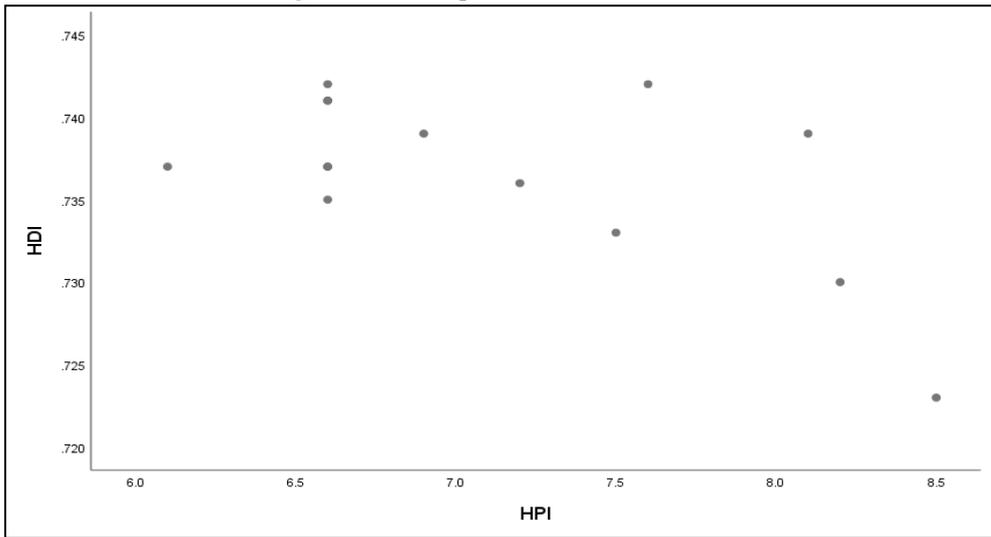
Figure 2: HDI and HPI trend in Jordan

4.1. Modeling HPI and HDI data

The scatter plot in Figure 3; showed that there is a linear (negative) relationships between HDI and HPI variables with correlation coefficient -0.603 (p-value = 0.022). Moreover, different universal resources reports different indicators (with closed values) and some of these indicators were estimated from a historical data; therefore, the model given in (1) is a good representation of the relationships between the HPI (x) and HDI (y). Hence, the suggested compounded MEM model will be for the HDI and HPI could be formulated as:

$$HDI = \alpha + \beta(HPI - \delta) + \varepsilon$$

Where α and β are the intercept and the slope, respectively, and δ and ε are the error terms.

Figure 3: Scatter plot of HDI and HPI

based on the equation given in 2 and 3, the estimated values of the MEM will be

$$\widehat{HDI} = 0.762 - 0.004 HPI$$

which indicate a negative relationship between HDI and HPI. Such result make the Jordanian government facing the worst public delima which should push the decision makers in Jordan to change their policies and planning strategies to improve the Jordanians life expectancy, educational attainment, and income.

5. PRACTICAL IMPLICATIONS OF THE MAIN FINDINGS

In this article, the relationships between HDI and HPI are analyzed for the Jordanian data between 2003 and 2016. The most important results indicated that there is a negative relationship between both variables and the Jordanian policy working in a right direction by increasing the human development and decreasing the poverty index in the last decade. This could be explained by the fact that Jordanian policy was able to identify the most appropriate national policies and key strategies to ensure that will enable every Jordanian citizen to achieve at least basic human development and to sustain and protect the gains.

There are several ways in which the results of our study would support or encourage the decision maker to improve the local policies to improve the quality of life when we are dealing with the common components of the HDI or HPI; "education, health and income". The negative relationship between both variables is not good enough to say that the decision makers are doing well in solving the society problems at or under the poverty line. It is worth to mention that, Jordan has the best educational system as well as the health care services in the region and at the same time we have a reasonable income, even though at the individual level we still suffering from the quality of services when we are talking about the people under the poverty line.

An important concern is how the decision makers in Jordan will work to increase the level of HDI and keep decreasing the level of HPI at the same time and try to decrease the unemployment rate (UR) which is an inter related factor that effect directly these two variables. Also, solving the problem of lack of information on all components that forms the main variables. Looking back to the published UN's data within the period 2011 to 2016, the HPI has the same value, which means that they still using the same old data of 2011 to compute this index even Jordan faced several external factors that should change the value of HPI within these years. Future studies we are more concern to involve several variables that effect of the HDI such as UR, and extend the study to the MENA region.

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APPENDIX.1

HDI and HPI data in Jordan

Date	HDI	HPI
2003	0.723	8.5
2004	0.730	8.2
2005	0.733	7.5
2006	0.736	7.2
2007	0.739	8.1
2008	0.742	7.6
2009	0.739	6.9
2010	0.737	6.1
2011	0.735	6.6
2012	0.737	6.6
2013	0.737	6.6
2014	0.741	6.6
2015	0.742	6.6
2016	0.741	6.6

Resources:

- (1) World Fact Book
- (2) UNDP organization
- (3) Nation Master.com