

## **Inequality in Income Distribution and Economic Development: Evidence Using Alternative Measures of Development<sup>\*</sup>**

John Mukum Mbaku<sup>\*\*</sup>

We test the Kuznets hypothesis about the relationship between development and income inequality using the alternative measures HDI and PQLI to control for the level of development. In earlier studies of the development-inequality relationship, researchers have controlled for development by using GNP per capita. The results obtained have been mixed. Results from previous studies may have been affected by the type of measure used for economic development. Using the HDI and PQLI to control for development has produced more consistent results. Results from the present study, however, are preliminary. As more accurate and comparable measures of both income inequality and development are developed, researchers will be able to effectively determine the role played by development in income inequality.

### **I. Introduction**

The study of the relationship between income inequality and the level of economic development in a country has interested social scientists for many years. In the 1970s, when more comparable data series on the distribution of income within countries at different levels of development became available, researchers increased their interest in determining the relationship between inequality and development. Many of these studies used the gross national product per capita to control for the level of economic development (Simpson (1990)). The gross national product per capita is now regarded as an inappropriate indicator of the level of development, especially in cross-national studies.

Alternative measures such as the Physical Quality of Life Index (PQLI) and the Human Development Index (HDI) have emerged as preferred and more effective measures of development (Morris (1979), Hicks and Streeten (1979), UNDP (1990)). The present study will employ the data set used by Simpson (1990) to examine the relationship between income inequality and economic development. Unlike Simpson (1990), the alternative development indicators HDI and PQLI, will be used to control for the level of development. As far as we know, this is the first attempt to test the Kuznets hypothesis using alternative indicators for development.

According to the Kuznets (1955, 1963) hypothesis, inequality in income distribution is greatest at the early stages of development, and falls eventually as the country achieves higher levels of development. During the initial stages of economic development, the rich and affluent classes

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<sup>\*\*</sup> Professor of Economics, Weber State University, Ogden, Utah, USA.

save at a significantly higher rate than the poor and highly deprived classes. In addition, industrialization and the development of an urban sector produce a relatively wealthy middle class made up of merchants, artisans, and civil servants, all of whom belong to the money economy. The mass of the rural classes, most of whom are peasants, remain outside the exchange economy. During the second stage of development, income inequality begins to fall as the increased demand for labor in the industrial urban sector increases the rate of rural-to-urban migration and thus shrinks the rural labor force. Additionally, the affluent classes become fiscally conservative and commit less to high risk investments. The new urban migrants, however, aggressively pursue investments in the emerging industries and grow rich. In addition, they work harder, save more and continue to pursue new investment opportunities (Ahluwalia (1976), Chenery and Syrquin (1975), Isaacs (1981), Kuznets (1963, 1976a, 1976b), Paukert (1973)).

Kuznets' hypothesis has received significant attention in the literature on economic growth and development, and distribution of resources. Among scholars suggesting theoretical models to explain the hypothesis have been Kuznets (1976a, 1976b), Cromwell (1977), Fields (1979), Knight (1976), Nugent (1983), and Robinson (1976). Kuznets initially suggested the hypothesis based on an examination of historical data for developed and industrialized countries. Since then, however, regression methods have been used to study countries that began their growth and development process after World War II.

Although many scholars believe that the Kuznets hypothesis is a fair approximation of movements in income inequality during the process of economic growth in a country, they are not all agreed on the extent to which empirical studies support the hypothesis (Brault (1983), Ram (1995)). Saith (1983) is skeptical about the validity of the paradigm and argues that the "U-Hypothesis is more of a hindrance than an aid" to understanding the relationship between economic development and income inequality. Anand and Kanbur (1984) also criticize the evidence that has been used in the past to support the hypothesis. Among investigators whose empirical studies have offered varying degrees of support for the Kuznets hypothesis are Cline (1975), Cromwell (1977), Papanek (1978), Papanek and Kyn (1986), Paukert (1973), and Simpson (1990). The main purpose of this article is to use alternative measures of the level of development to test the relationship between inequality and development.

## II. The Theoretical Model

Several theoretical models have been used to test the Kuznets hypothesis. Here, we consider the specification in which a measure of income inequality (INEQ) is related to the level of per capita income (GNPCAP) and its square (GNPCAP<sup>2</sup>)

$$\text{INEQ} = a + b \text{GNPCAP} + c \text{GNPCAP}^2 + u \quad (1)$$

where  $a$  is the intercept or constant term of the model,  $b$  and  $c$  are the slope parameters which are expected to be positive and negative respectively, and  $u$  is the randomly distributed error term. In Equation (1), the level of economic development is measured by per capita income. Traditionally, researchers have used the gross national product and its derivatives to measure economic development. In recent years, however, several scholars have criticized this practice

and have subsequently developed alternative indicators for gauging levels of development across countries (Streentzen (1977), Morris (1979), UNDP (1990)). Among these are the Physical Quality of Life Index (PQLI) and the Human Development Index (HDI). The latter is the latest among these alternative development measures and was developed by the United Nations in 1990 (UNDP (1990), p. 13 and 109). In a recent study, Simpson (1990) found economic development to have no consistent direct effect on income inequality. Economic development in the Simpson (1990) study was measured by GNP per capita. It is possible that his results were affected by the economic development measure he employed. Significant evidence exists in the literature to the effect that the PQLI and the HDI are better and more effective measures of economic development (Bradshaw and Tshandu (1990), Mbaku and Kimenyi (1992)). In cross-national studies that involve both developed and developing countries, GNP per capita does not appear to be an appropriate variable to control for the level of development. It is hoped that the use of alternative measures such as the PQLI and the HDI will improve the results and allow us to more effectively determine the relationship between the level of development and income inequality. To test the relationship between inequality and economic development, the following equations will be estimated:

$$\text{GINI} = d + e \text{ LNGNPCAP} + f (\text{LNGNPCAP})^2 + u_2 \quad (2)$$

$$\text{ISTQ} = g + h \text{ LNGNPCAP} + i (\text{LNGNPCAP})^2 + u_3 \quad (3)$$

$$\text{TQ/BQ} = j + \text{LNGNPCAP} + k (\text{LNGNPCAP})^2 + u_4 \quad (4)$$

where, GINI, ISTQ and TQ/BQ are measures of income inequality; ISTQ is the income share of the top quintile, GINI is the Gini coefficient of income inequality, and TQ/BQ is the ratio of the income share of the top quintile (20%) to that of the bottom quintile (20%); LNGNPCAP is the gross national product per capita (logged), used to measure the level of development in a country (other measures of development that will also be employed in this study include the HDI, and the PQLI); and  $u_2$ ,  $u_3$ ,  $u_4$  are randomly distributed error terms.

The data for the income inequality measures are obtained from Simpson (1990), and several issues of the World Bank's *World Development Report*. The data for the three variables are for the period 1965-75 and are for surveys of households and individuals. Data based on surveys of the economically-active population are not included. The appendix contains data on the ISTQ and the GINI variables and the data used to calculate TQ/BQ. The summary statistics are reported in Table 1.

As discussed earlier, Simpson's (1990) and other results may have been affected by the used of an inappropriate control for the level of economic development. Thus, in this study, in addition to the GNP per capita, the HDI, and the PQLI will be used as measures of economic development. The natural log of the GNP per capita (LNGNPCAP) for 1970 will be employed. Data on the GNP per capita are obtained from the World Bank (1991), that for the PQLI for 1970 are obtained from Morris (1979), and that for the HDI for 1970 from UNDP (1992).

**Table 1 Sample Characteristics: Means and Standard Deviations**

| Variable                         | Mean      | Standard Deviation |
|----------------------------------|-----------|--------------------|
| GNP per capita (logged)          | 6.5214    | 1.1400             |
| GNP per capita (logged), squared | 43.8058   | 14.8458            |
| HDI                              | 0.6244    | 0.2530             |
| HDI, squared                     | 0.4528    | 0.2819             |
| PQLI                             | 70.8448   | 23.6330            |
| PQLI, squared                    | 5567.8793 | 3063.4367          |
| GINI                             | 41.9931   | 8.5003             |
| ISTQ                             | 50.5172   | 8.7001             |
| TQ/BQ                            | 11.8682   | 7.9880             |

Notes: Data on GINI and ISTQ are obtained from Simpson, M., "Political Rights and Income Inequality: A Cross-National Test," *American Sociological Review*, 55, 1990, pp. 689-691. Data on TQ/BQ are obtained from World Bank, *World Development Report* (several issues). Data on GNP per capita are obtained from World Bank, *World Tables*, 1991. Data on HDI are obtained from UNDP, *Human Development Report*, 1992. Data for PQLI are obtained from Morris, D. M., *Measuring the Condition of the World's Poor: The Physical Quality of Life Index*, Pergamon Press, New York, 1979.

The results of the multivariate analysis are reported in Tables 2, 3 and 4. We shall begin the analysis by taking a look at the results in Table 2, where income share of the top quintile (ISTQ) is used as the measure for income inequality. The gross national product per capita (logged), the HDI and the PQLI are used to control for the level of economic development. The first equation in Table 2 gives results for the relationship between inequality in income distribution and economic development where the latter is measured by the gross national product per capita. The results confirm the Kuznets hypothesis that income inequality is a second-order polynomial function of the level of economic development. The coefficients are significant at the 1% level. When the alternative indicators HDI and PQLI are used to measure the level of economic development, the results are improved significantly. The adjusted  $R^2$  rises in Equation 2 (Table 2) to almost 60% and to more than 60% in Equation 3. In both equations, the coefficients of the development measures are of the expected signs and are significant at the 1% level.

**Table 2 Regression Results for Effects of Economic Development on Income Inequality**  
**Dependent Variable: Income Share of the Top Quintile (ISTQ)**

| Independent Variables                  | 1                     | 2                    | 3                     |
|----------------------------------------|-----------------------|----------------------|-----------------------|
| GNP per capita (logged), 1970          | 24.1654<br>(2.8274)a  | -                    | -                     |
| GNP per capita (logged), 1970, squared | -2.2207<br>(-3.3837)a | -                    | -                     |
| PQLI, 1970                             | -                     | -                    | 0.9066<br>(4.2075)a   |
| PQLI, 1970, squared                    | -                     | -                    | -0.0090<br>(-5.4210)a |
| HDI, 1970                              | -                     | 61.4692<br>(3.9859)a | -                     |

**Table 2 (Continued)**

| Independent Variables  | 1                    | 2                      | 3                    |
|------------------------|----------------------|------------------------|----------------------|
| HDI, 1970, squared     | -                    | -75.6091<br>(-5.4634)a | -                    |
| Constant               | -9.7930<br>(-0.3597) | 46.3703<br>(12.3671)a  | 36.4624<br>(5.8216)a |
| R-squared              | 0.4790               | 0.5992                 | 0.6503               |
| Adj. R-squared         | 0.4600               | 0.5846                 | 0.6376               |
| F                      | 25.2804              | 41.1124                | 51.1366              |
| Number of observations | 58                   | 58                     | 58                   |

Notes: The t-statistics are given in parentheses. The letter a after the t-square indicates significance at the 1% level.

In Table 3, the Gini coefficient is used as the dependent variable. As was the case with the results in Table 2, the gross national product per capita (logged), the HDI and the PQLI are used to control for the level of economic development. These results are consistent with those reported in Table 2. The equations in which economic development is measured by the alternative indicators (HDI and PQLI) perform better than those in which the gross national product per capita is the measure of economic development.

**Table 3 Regression Results for Effects of Economic Development on Income Inequality**  
**Dependent Variable: Gini Coefficient of Income Inequality**

| Independent Variables                  | 1                     | 2                      | 3                     |
|----------------------------------------|-----------------------|------------------------|-----------------------|
| GNP per capita (logged), 1970          | 23.9985<br>(2.5940)a  | -                      | -                     |
| GNP per capita (logged), 1970, squared | -2.1400<br>(-3.0124)a | -                      | -                     |
| PQLI, 1970                             | -                     | -                      | 0.9521<br>(4.0329)a   |
| PQLI, 1970, squared                    | -                     | -                      | -0.0091<br>(-4.9945)a |
| HDI, 1970                              | -                     | 65.6284<br>(3.9457)a   | -                     |
| HDI, 1970, squared                     | -                     | -76.2398<br>(-5.1078)a | -                     |
| Constant                               | -20.7643<br>(-0.7046) | 35.5348<br>(8.7870)a   | 25.1884<br>(3.6705)a  |
| R-squared                              | 0.3605                | 0.5116                 | 0.5602                |
| Adj. R-squared                         | 0.3372                | 0.4938                 | 0.5442                |
| F                                      | 15.5019               | 28.8052                | 35.0318               |
| Number of observations                 | 58                    | 58                     | 58                    |

Notes: The t-statistics are given in parentheses. The letter a after the t-square indicates significance at the 1% level.

Simpson (1990) and other researchers used the income share of the top quintile (ISTQ) as a measure of income inequality. We do the same in this study (see Table 2). However, it is generally believed that the ratio of the top quintile to that of the bottom quintile (TQ/BQ) is a better measure of income inequality than the ISTQ alone. Thus, in Table 4, we report regression results for the effects of economic development on income inequality with TQ/BQ as the dependent variable. As was the case with the results in Tables 2 and 3, the gross national product per capita (logged), the HDI and the PQLI are used to control for the level of economic development. These results are consistent with those reported in Tables 2 and 3. The equations in which economic development is measured by the alternative indicators (HDI and PQLI) perform better than those in which the gross national product per capita is the measure of economic development.

**Table 4 Regression Results for Effects of Economic Development on Income Inequality**  
**Dependent Variable: Ratio of Income Share of Top Quintile to That of**  
**the Bottom Quintile (TQ/BQ)**

| Independent Variables                  | 1                     | 2                      | 3                     |
|----------------------------------------|-----------------------|------------------------|-----------------------|
| GNP per capita (logged), 1970          | 35.2222<br>(3.6790)a  | -                      | -                     |
| GNP per capita (logged), 1970, squared | -2.8436<br>(-3.8620)a | -                      | -                     |
| PQLI, 1970                             | -                     | -                      | 1.0011<br>(3.2609)a   |
| PQLI, 1970, squared                    | -                     | -                      | -0.0086<br>(-3.6370)a |
| HDI, 1970                              | -                     | 74.2278<br>(3.4425)a   | -                     |
| HDI, 1970, squared                     | -                     | -75.8984<br>(-3.8802)a | -                     |
| Constant                               | -92.9038<br>(-3.0600) | -0.3268<br>(-0.0634)a  | -11.1434<br>(-1.2389) |
| R-squared                              | 0.2885                | 0.2940                 | 0.2954                |
| Adj. R-squared                         | 0.2576                | 0.2633                 | 0.2648                |
| F                                      | 9.3280                | 9.5771                 | 9.6434                |
| Number of observations                 | 49                    | 49                     | 49                    |

Notes: The t-statistics are given in parentheses. The letter a after the t-square indicates significance at the 1% level. Some countries were eliminated for lack of data.

The results obtained in this study confirm the inverted-U hypothesis for economic development (as measured by the gross national product per capita, HDI, and PQLI) when Gini, the ISTQ, and TQ/BQ are used as dependent variables. Although gross national product per capita (logged) has a direct effect on income inequality, when the alternative indicators are used as controls for the level of development, the results improve significantly. These results indicate that some previous studies may have suffered from the use of inappropriate measures for development. As more comparable data on income inequality are developed, researchers will have the opportunity to retest the Kuznets hypothesis using the alternative indicators to control for the level of economic development.

### **III. Conclusion**

The primary purpose of this study was to re-examine the relationship between income inequality and economic development, using alternative measures for the latter. The results obtained in this study show that economic development, as measured by the HDI and the PQLI explain more variation in income inequality than the gross national product per capita.

In his study, Simpson (1990) argued that the second-order polynomial of gross national product was not consistently significant because of measurement error. In the present paper, we argue that while there may, indeed, be problems with the measurement of income inequality, GNP per capita is an incomplete measure of development. GNP per capita as a development indicator does not tell us national spending habits, especially the relationship between public and private spending. The former can especially be important for development. If it is determined, for example, that the infant mortality rate (part of the alternative indicator, PQLI) in a country is falling one can conclude that there has been an increase in the consumption of goods that generate positive externalities, such as health clinics, prenatal and postnatal care centers, and improved water systems. While historical data on the PQLI will reveal these changes in national spending habits, GNP per capita data are incapable of providing us with an indication of the after-tax distribution of income within the country. Similarly, increases in the infant mortality rate may also indicate after-tax resource allocation that is not revealed by GNP per capita. Thus, the alternative measures are more complete controls for the level of development in a country. To properly determine the relationship between economic development and income inequality requires that appropriate measures be found for both. In the past researchers have used the gross national product as a measure of development and have obtained results that show the former to have no direct effect on inequality. This study has shown that the problem may be that GNP is an incomplete measure of development. Use of alternative measures has produced more consistent results. These results, however, are preliminary. As more accurate and comparable measures of both income inequality and development are developed, researchers will be able to effectively determine the role played by development in income inequality, and in addition, find other determinants of income inequality.

## Appendix

| COUNTRY             | ISTQ | GINI | LOWEST<br>20% | HIGHEST<br>20% |
|---------------------|------|------|---------------|----------------|
| Austria             | 44.0 | 37.1 | ..            | ..             |
| Belgium             | 39.8 | 34.0 | 7.9           | 36.0           |
| Canada              | 41.0 | 33.8 | 5.0           | 41.0           |
| Denmark             | 43.2 | 36.7 | 5.4           | 38.6           |
| France              | 46.6 | 39.3 | 4.3           | 46.9           |
| East Germany        | 30.7 | 20.4 | ..            | ..             |
| West Germany        | 44.7 | 36.7 | 6.5           | 46.2           |
| Hungary             | 33.4 | 24.8 | 6.9           | 35.8           |
| Ireland             | 39.4 | 30.0 | 7.2           | 39.8           |
| Italy               | 46.5 | 38.0 | 5.1           | 46.5           |
| Netherlands         | 40.0 | 30.0 | 8.5           | 37.1           |
| Norway              | 37.3 | 30.0 | 6.3           | 37.1           |
| Portugal            | 49.1 | 40.0 | 5.2           | 49.1           |
| Spain               | 45.2 | 36.0 | 6.0           | 42.2           |
| Sweden              | 40.5 | 33.9 | 6.6           | 37.0           |
| Switzerland         | 46.5 | 40.1 | 6.6           | 38.0           |
| UK                  | 39.6 | 31.4 | 7.4           | 39.5           |
| US                  | 45.0 | 40.8 | 4.5           | 42.8           |
| Yugoslavia          | 41.4 | 34.7 | 6.6           | 38.7           |
| Argentina           | 50.3 | 41.4 | 4.4           | 50.3           |
| Barbados            | 44.0 | 33.4 | ..            | ..             |
| Bolivia             | 61.0 | 49.0 | ..            | ..             |
| Brazil              | 66.6 | 56.5 | 2.0           | 66.6           |
| Chile               | 53.6 | 46.5 | 4.4           | 51.4           |
| Colombia            | 59.0 | 52.1 | 4.0           | 53.0           |
| Costa Rica          | 50.5 | 42.8 | 3.3           | 54.8           |
| El Salvador         | 54.4 | 46.0 | 5.5           | 47.3           |
| Guatemala           | 58.8 | 46.0 | 2.1           | 63.0           |
| Honduras            | 67.3 | 59.6 | 2.3           | 67.8           |
| Mexico              | 63.6 | 55.2 | 2.9           | 54.4           |
| Nicaragua           | 60.0 | 51.0 | ..            | ..             |
| Panama              | 61.8 | 54.0 | 2.0           | 61.8           |
| Peru                | 61.0 | 54.0 | 1.9           | 61.0           |
| Trinidad and Tobago | 50.0 | 42.0 | 4.2           | 50.0           |
| Uruguay             | 47.4 | 40.0 | ..            | ..             |
| Venezuela           | 59.7 | 54.6 | 3.0           | 54.0           |
| Egypt               | 48.5 | 40.5 | 5.8           | 48.0           |

**Appendix (Continued)**

| <b>COUNTRY</b> | <b>ISTQ</b> | <b>GINI</b> | <b>LOWEST<br/>20%</b> | <b>HIGHEST<br/>20%</b> |
|----------------|-------------|-------------|-----------------------|------------------------|
| Iran           | 62.7        | 52.0        | ..                    | ..                     |
| Tunisia        | 55.0        | 46.0        | 5.9                   | 46.3                   |
| Turkey         | 59.3        | 51.6        | 3.4                   | 56.5                   |
| Ghana          | 47.8        | 39.1        | 7.0                   | 44.1                   |
| Côte d'Ivoire  | 57.2        | 49.0        | 2.4                   | 61.4                   |
| Malawi         | 51.5        | 40.5        | 10.4                  | 50.6                   |
| Senegal        | 60.4        | 47.0        | ..                    | ..                     |
| Sierra Leone   | 58.3        | 49.4        | 5.6                   | 52.5                   |
| South Africa   | 58.0        | 53.0        | ..                    | ..                     |
| Sudan          | 49.8        | 41.0        | 4.0                   | 49.8                   |
| Tanzania       | 56.7        | 50.0        | 5.8                   | 50.4                   |
| Zambia         | 63.0        | 51.0        | 3.4                   | 61.1                   |
| Australia      | 41.9        | 35.4        | 6.1                   | 38.8                   |
| India          | 51.8        | 44.0        | 6.7                   | 48.9                   |
| Indonesia      | 52.0        | 38.9        | 6.6                   | 49.9                   |
| Japan          | 42.5        | 33.2        | 7.9                   | 41.0                   |
| Malaysia       | 56.3        | 48.6        | 3.3                   | 56.6                   |
| New Zealand    | 42.4        | 34.5        | 5.1                   | 44.7                   |
| Philippines    | 54.0        | 40.2        | 3.7                   | 53.9                   |
| Sri Lanka      | 44.6        | 34.9        | 7.5                   | 43.4                   |
| Thailand       | 53.4        | 44.0        | 5.6                   | 49.8                   |

Notes: Data on GINI and ISTQ are obtained from Simpson, M., "Political Rights and Income Inequality: A Cross-National Test," *American Sociological Review*, 55, 1990, pp. 689-691. Data on income shares to the top and bottom quintiles are obtained from World Bank, *World Development Report* (several issues). That data were used to calculate the variable TQ/BQ. Data on GNP per capita are obtained from World Bank, *World Tables*, 1991. Data on HDI are obtained from UNDP, *Human Development Report*, 1992. Data for PQLI are obtained from Morris, D. M., *Measuring the Condition of the World's Poor: The Physical Quality of Life Index*, Pergamon Press, New York, 1979. The countries Gabon, Kenya, Pakistan, and South Korea were found to be outliers and were excluded from the final regressions. LOWEST 20% AND HIGHEST 20% represent income shares of the bottom and top quintiles respectively.

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