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John Thornton

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# The Kuznets inverted-U hypothesis: panel data evidence from 96 countries

JOHN THORNTON

International Monetary Fund, 700 19th Street NW, Washington DC, USA

E-mail: [jthornton@imf.org](mailto:jthornton@imf.org)

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Regression results from a panel data set of high-quality comparable data on Gini coefficients, income quintiles and real GDP per capita in 96 countries over the postwar period, suggest that the relation between income inequality and development corresponds to an inverted-U, as hypothesized by Kuznets.

## I. INTRODUCTION

The Kuznets (1955, 1963) ‘inverted-U’ hypothesis suggests that, as a country develops, income inequality worsens initially but then improves as development proceeds. Kuznets argues that this is due to a shift of labour from low-productivity to high-productivity sectors in the early stage of development, which results in an increasing disparity in wages. Later, however, the high-productivity sector comes to dominate the economy, and wage inequality decreases. Aghion and Bolton (1992) and Galor and Tsiddon (1996) derive the Kuznets curve from the assumption that a (small) class of rich provides enough savings to begin the process of capital accumulation. The returns to their investment initially cause a widening of the distribution of income but, as aggregate income rises over time, the number of households that can afford to invest expands and the distribution narrows again.

The empirical evidence on the relationship between income redistribution and growth is still quite weak. Kuznets originally based his curve on observations of only three countries (Germany, the UK and the USA) and, although later studies extended the sample to as many as 60 countries, the empirical basis of the Kuznets curve remains in some dispute (see Anand and Kanbur, 1993). One fundamental problem has been the difficulty in constructing income distribution series that are comparable across countries. In this paper, the results of a test of the Kuznets hypothesis using a panel data set comprising income distribution and real GDP from 96 countries are reported. The results support the Kuznets hypothesis:

income inequality appears to decline at higher income levels; moreover, a substantial part of the sample space is marked by an increasing tendency to greater income equality.

## II. MODEL, DATA AND RESULTS

The basic form of the Kuznets hypothesis suggests a quadratic relation between income inequality and real GDP (the level of development), in which inequality increases with real GDP at early stages and, after reaching a peak, declines with economic growth. A common specification along these lines is:

$$INEQ_{it} = \alpha_0 + \beta_1 \ln Y_{it} + \Omega_1 (\ln Y_{it})^2 + \varepsilon_{it} \quad (1)$$

where  $INEQ_{it}$  is a measure of income inequality in country  $i$  and year  $t$ ,  $\ln Y$  denotes the natural logarithm of real gross domestic product (GDP) per capita to represent the level of economic development, and is a zero-mean, serially uncorrelated error term. The Kuznets hypothesis implies  $\beta_1 > 0$ ,  $\Omega_1 < 0$ , provided that the entire ‘inverted-U’ is captured. The data on income distribution are from a recent high-quality compilation by Deininger and Squire (1996) which provides comparable series on the Gini index and quintile income shares for a large number of countries over much of the post World War II period; the panel is restricted to the subset of data which, in the view of those authors, is the highest-quality comparable subset. Data on real GDP per capita are taken from the January 1995 update (PWT 5.6) of Summers and Heston (1991),

Table 1. *Kuznets-type quadratic estimates from panel data for 96 countries*

Model observed	Constant	$\ln Y$	$(\ln Y)^2$	$R^2/SEE$	
(a) <i>GINI</i>	−27.1509 (1.8162)	17.5852* (4.4012)	−1.1871* (4.4653)	0.0288 (9.2064)	611
(a) <i>EQUAL</i>	0.5581* (5.1400)	−0.0781* (2.6857)	0.0049* (2.5070)	0.0127 (0.0659)	547

Notes: *t*-statistics are in parenthesis below the parameter estimates;  $R^2$  is adjusted for degrees of freedom; SEE is the standard error of the regression; the Gini coefficient (*GINI*) is measured in percentage points, the income share of the bottom 40 percent of the population (*EQUAL*) is in decimal points;  $\ln Y$  is the logarithm of real GDP per capita in thousands of US dollars at 1985 international prices. \* Implies statistically significant at the 95% level.

and the variable is measured in thousands of US dollars in international prices.

Table 1 presents estimates from two specifications of Equation 1. Panel (a) of the table reports the result using the Gini coefficient (*GINI*) as the measure of income inequality; in this case, the data set allows 611 observations from 96 developed and developing countries. Panel (b) reports the result using the sum of the first and second income quintiles (*EQUAL*) as the dependent variable, and for which the data set allow 547 observations from the same 96 countries; in this specification support for the Kuznets hypothesis implies  $\beta_1 < 0$ ,  $\Omega_1 > 0$ . The results for the Gini coefficient reported support the hypothesis that the relation between income inequality and economic development takes the form of an inverted-U: the coefficients on  $\ln Y$  and  $(\ln Y)^2$  are positive and negative, respectively, and are statistically significant at the 95 percent level. Thus, as real GDP per capita has increased, income inequality appear to have at first increased but then declined. The results using the first and second income quintiles as the dependent variable also support the Kuznets hypothesis: the coefficients on  $\ln Y$  and  $(\ln Y)^2$  are negative and positive, respectively, and are statistically significant at the 95% level. A rough estimate of the sample turning point on the inverted-U can be derived by taking the exponent of  $(-\beta_1/2\Omega_1)$  in Equation 1. Thus, the shift to greater income equality occurs when real GDP per capita is around \$1647 when the Gini coefficient variable and around \$2891 when the sum of the bottom two income quintiles is the dependent variable; both of these figures are well below the mean and median real GDP per capita for the sample (\$3644 and \$3019, respectively) suggesting that the ‘turn’ occurs early in the sample space, i.e. at a relatively low level of income.

### III. CONCLUSION

This note reports results from a test of the relation between income inequality and real GDP growth per capita using a panel of high-quality, comparable data on Gini coefficients, income quintiles and real GDP per capita in 96 countries. The results suggest that the relation corresponds to an inverted-U, as hypothesized by Kuznets, and that the turning point on the inverted-U occurs at a relatively low level of income.

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