

Introduction

The inverted – U hypothesis or the Kuznet's curve suggests a relationship between growth of income and inequality in a country. It implies that economic development is an uneven process (Devraj Ray), it pulls up certain groups first causing inequality to widen in the initial stage and then later as everyone catches up inequality falls. Thus, when you graph an inequality measure on the y axis and per capita income on the x axis, the plot looks like an inverted – U. This was first tested by Kuznets in 1955, in an attempt to show a correlation between income and inequality. The study found out that income shares of the upper income groups in the developed countries was much lower than their developing counterparts (so more inequality in developing countries), thus, backing the inverted – U.

Methodology

This essay aims to test the inverted – U hypothesis by imitating the methodology of the Ahluwalia (1976) study. For this purpose, income data that included income shares divided into five quintiles (richest 20% to poorest 20%) and GDP per capita was collected for the year 2018 for a total of 60 countries: 3 socialist (China, Vietnam, Lao PDR), 14 developed, and 43 developing. Due to data limitations and differences in structural parameters of countries between 1970 and 2018, only 3 socialist countries could be included in the analysis. The bottom and middle two quintiles were merged into bottom 40% and middle 40% respectively. A dummy variable D was created for socialist countries (takes 1 if country is socialist and 0 otherwise). Another variable Y was created to represent log of GDP per capita and its squared form Y^2 was also included in the analysis. Lastly, upon running a regression for the three income shares (richest 20%, middle 40%, and bottom 40%),

$$S_i = A + by + cy^2 + D + u$$

Here, S_i —> income share of the i^{th} quintile

y —> log of per capita GDP

D —> socialist dummy

A, b, c —> beta coefficients

. regress highest20 Y Y2 D

Source	SS	df	MS	Number of obs	=	60
Model	293.462219	3	97.8207397	F(3, 56)	=	3.44
Residual	1592.34761	56	28.4347788	Prob > F	=	0.0228
				R-squared	=	0.1556
				Adj R-squared	=	0.1104
Total	1885.80983	59	31.9628785	Root MSE	=	5.3324

highest20	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Y	56.29925	25.44405	2.21	0.031	5.328686	107.2698
Y2	-7.347376	3.129179	-2.35	0.022	-13.61587	-1.078878
D	.2264332	3.885537	0.06	0.954	-7.557232	8.010098
_cons	-61.65611	51.28245	-1.20	0.234	-164.3872	41.07499

. regress middle40 Y Y2 D

Source	SS	df	MS	Number of obs	=	60
Model	129.131255	3	43.0437517	F(3, 56)	=	4.39
Residual	548.630548	56	9.79697406	Prob > F	=	0.0076
				R-squared	=	0.1905
				Adj R-squared	=	0.1472
Total	677.761803	59	11.4874882	Root MSE	=	3.13

middle40	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Y	-34.50339	14.93507	-2.31	0.025	-64.42194	-4.584846
Y2	4.542187	1.836756	2.47	0.016	.8627228	8.221651
D	-.3833055	2.28072	-0.17	0.867	-4.952138	4.185527
_cons	91.26862	30.10162	3.03	0.004	30.96784	151.5694

. regress bottom40 Y Y2 D

Source	SS	df	MS	Number of obs	=	60
Model	33.8359417	3	11.2786472	F(3, 56)	=	2.27
Residual	277.665911	56	4.95831984	Prob > F	=	0.0898
				R-squared	=	0.1086
				Adj R-squared	=	0.0609
Total	311.501853	59	5.27969242	Root MSE	=	2.2267

bottom40	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Y	-21.50753	10.62499	-2.02	0.048	-42.79195	-.2231165
Y2	2.770474	1.30669	2.12	0.038	.1528584	5.388089
D	.1496003	1.622532	0.09	0.927	-3.100722	3.399923
_cons	69.79748	21.41466	3.26	0.002	26.89877	112.6962

This model includes both y and y^2 , allowing for a non-linear relationship that can capture the U shape. Including both terms lets us examine if income inequality initially increases with income and subsequently decreases, an outcome suggested by a positive b coefficient and a negative c coefficient.

Results:

This regression equation shows the effect of an increase in per capita GDP (income) on income shares (inequality measure).

Income Share	Constant	y	y^2	Socialist dummy	R^2
Top20%	-61.65611	56.29925	-7.347376	0.2264332	15.56%
Middle40%	91.26862	-34.50339	4.542187	-0.383305	19.05%
Lowest40%	69.79748	-21.50753	2.770474	0.1496003	10.86%

Mathematically, a U shape can occur only if b and c are of opposite signs. Precisely, if $b > 0$ and $c < 0$ then shape is essentially an inverted – U and an upright – U if $b < 0$ and $c > 0$ then income inequality is consistent with the inverted – U hypothesis.

Here, the regressed curves for the middle and bottom quintiles take the form of an upright – U, and that of the topmost quintile is an inverted – U. For the lower quintiles income shares tend to fall initially as per capita income rose and then increased beyond a certain point (negative coefficient for b and positive coefficient for c), on the other hand, for the topmost quintile the results were reversed, income shares tend to increase initially with per capita income then falls after a point, implying that there is a progressive redistribution of income from higher to lower quintiles over time.

For a 5% significance level, the regression coefficients b and c are significant for all three income shares, thus validating the inverted – U. Therefore, as economic growth increases in countries there may be economic inequality initially but it adjusts over the long run.

However, there are many reasons to believe that the inverted – U hypothesis is not a universal rule for economic growth and income inequality. First, there is a lot of variation in inequality between countries and per capita income alone cannot explain inequality across countries as factors such as policy play a big role. Secondly, statistical methods themselves can create the appearance of an inverted-U. For example, as people shift from low-income sectors (agriculture) to higher-income sectors (information technology), inequality may seem to rise and fall due to this shift, rather than a change in economic development. Using different methods or adding factors specific to each country make the inverted-U pattern disappear, showing it's not universal. Thirdly, “The Latin Effect” which says that most of the high inequality middle- income countries are Latin American countries and the inverted – U is just an artificial consequence of the Latin American countries sitting in the middle. These countries have higher inequality due to structural reasons that doesn't necessarily correlate to economic growth. So, the study by Ahluwalia doesn't allow for much structural differences among countries.

Conclusion

Ahluwalia's methodology supports the inverted – U hypothesis, therefore, a non – linear relationship between economic growth and income inequality. This implies that inequality may worsen during the initial stages of economic growth, as resources are concentrated among those already better off. However, as economies mature (developed countries), growth begins to benefit widely, reducing inequality. For policy implications, redistributive policies at the initial stages of development, in developing countries, may be necessary. For developed countries, this hypothesis explains why matured economies see benefits of development more widely and lower inequality.

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