

Income Distribution and Economic Growth in the United States: 1947 - 2001

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1. Introduction

One is hard pressed to find a more important question in economics than the connection between growth and income distribution. Equally difficult is to find a policy debate that does not involve either directly or indirectly—through the efficiency vs. equity debate—the issues of growth and distribution. But what is the relationship between the two? The old wisdom maintained that income inequality has a positive effect on growth for three reasons. First, the rich consume proportionately less of their income, and a higher marginal propensity to save is conducive to a faster growth rate. Second, indivisibility of investment projects coupled with the lack of an effective capital market in developing countries make the concentration of resources in a few hands a prerequisite for investment and growth. Finally, workers and employers require incentive to exert their utmost efforts. A society committed to equality or where wages are independent of performance would not provide the incentive system necessary for growth.

Empirical research, however, does not support the old wisdom. Indeed, countries with less unequal distribution of income have experienced faster growth than their counterparts with more inequality. This research is mostly done using cross section data on different countries. Although there are problems with the data and some studies have reached contrary results, the preponderance of evidence supports a positive relationship between more equitable distribution of income and wealth and faster growth. These findings in turn have spawned a theoretical literature that tries to explain this relationship [Alesina and Rodrick (1994), Benabou (1996), Perotti (1996), and Forbes (1998); Aghion Caroli, and García-Pealosa (1999) for a survey of empirical theoretical literature; see also Gottschalk and Smeeding (1997)]. A number of models have been put forward. In particular, it is hypothesized that three factors may account for the positive relationship between income equality and growth. For one, inequality reduces investment opportunities; for another, inequality worsens borrowers' incentives; and finally, it generates macroeconomic volatility.

A related issue is the question of causality and feedback. If equality causes growth, is there a feedback loop where growth engenders more equality? If the answer is yes, then we have a virtuous circle where equality fosters growth and the latter results in a more equal distribution. On the other hand, if growth gives rise to inequality, there will be a permanent need for redistributive policies.

The importance of these findings and the new literature can hardly be exaggerated. In many debates on economic policy it is implicitly assumed that there is a trade-off between income equality and growth. Opponents of economic liberalization have contended that although these policies may espouse growth, they would benefit the rich and, therefore, would lead to more inequality. Proponents of liberalization and other growth-inducing policies too have bought into

this argument. Witness the argument for the trickle down effect or that in the long run the benefits will spread throughout the society. If indeed there is a trade-off between growth and income equality, then there is a need to devise policies that are optimal with respect to a social objective function that involves both growth and income equality. If there is no connection between the two, then policies espousing one or the other objective could be devised in isolation. But what if growth and income equality go hand in hand? What if growth leads to better distribution of income and the latter leads to growth? This would negate the implicitly assumed trade off between the two social objectives.

The empirical literature on the subject has two main weaknesses. First, it relies on cross section data from different countries where observations may not be consistent with each other and many are or might be of dubious origin and quality. Second, it pays little attention to refuting the old models which after all had a stronger behavioral underpinning. The present paper attempts a modest contribution to the debate by focusing on time series data. Using the longest time series available of very high quality data, I will investigate the connection between a more equitable distribution of income and economic growth. The findings of the paper reinforce what previous researchers have found using cross section data. There is, however, one surprising element here, that is, we find simultaneity between changes in income distribution and growth. This does not necessarily negate a causal relationship between the two. Rather, reminiscent of the Theil-Wold debate, the time period between cause-effect-feedback maybe less than or equal to a year.

In addition, I will explicitly test the Kaldor (1955-6) hypothesis. Close to 30 years ago, Alan Blinder (1975) did not find empirical support for Kaldor's hypothesis and called it a "failure." I repeat his estimation using more than 30 additional observations and find that within his framework, Kaldor's hypothesis is rejected. In view of the new findings on the relationship between growth and distribution, we cannot term it a failure anymore. I go one step further and specify a random walk model of consumption taking into account the effect of income on consumption. Then I retest Kaldor's hypothesis within this framework.

It may be argued that even if we can find such a relationship, a third factor may be driving both growth and income equality. Thus, the meaning and significance of the relationship depend on the cause of growth or the reason for a more equal distribution of income. In other words, such a finding may be confined to a particular time and place and would not have a policy implication. But what if we found the same phenomenon in countries that are "light years apart"? Could anyone argue that it is because of this or that specific cause?

What if we find the same phenomena in the United States, Iran, Sweden, and Taiwan? Indeed, this is what I have found which seems to me it is a story worth telling. The present paper is the first installment dealing with the case of the United States and reporting on two sets of interrelated empirical results. The empirical relation between growth and income inequality is explored in the first part of the paper. In particular, questions of causality and cointegration between the two are answered within a VAR framework. In the second part I look at the relationship between consumption and income inequality. Here I am interested to see if indeed a more equal distribution of income results in more consumption and, therefore, less savings which in turn would result in slower long-term growth.

2. Problems with Using Cross Section Data

The advantage of using cross national data is to overcome the lack of sufficient variation in measures of income distribution. Comparing growth rates of countries with different levels of income inequality could enable researchers to observe the effect of the latter on the former. But

there are two main problems with using cross section data. First, measures of income inequality for different countries do not convey the same information. Specifically, a gini coefficient of 0.43 in the United States may signify a more equal distribution of income than a measure of 0.39 in Spain or Iran. A way to overcome this is to take the growth rate of gini coefficient for different countries. But such a transformation would wipe out the benefit of cross country variations. Inequality measures may differ across countries but their rates of change are slow everywhere. In places where abrupt changes occur, it is usually the result of social and political upheavals such as revolutions or wars. In such cases the uncertainty created by the events has a far more powerful effect on growth than any change in income distribution. Second, there is great worry about the quality of the cross country data. In particular, the World Income Inequality Database of the World Institute for Development Economics Research of the United Nations University provides detailed information on the sources of income inequality measures. A large part of the data set comes from papers where authors have reported such measures though no effort has been made to check against original sources or to see if the measure for a particular country coming from different sources is consistent over time. But there is a danger in accepting these statistics at face value. Let me give an example. Spånt (1980) provides a data series on Swedish income distribution dating back to 1929 and gives as the source of the data another paper by himself. When I asked the Statistics Sweden for income distribution data, I received an email stating that no such data exists for years prior to 1975. The question then is where did Spånt get his data? Similarly, a number of papers refer the income inequality data provided by the World Bank. It is not clear when and how such data are collected and how reliable they are.

These considerations point us toward collecting consistent and reliable time series data for as many countries as possible and seeing if a pattern emerges that is invariant across countries that are structurally different from one another. Note that pooling time series and cross section data in the early stages would require two restrictions on the researcher. First, in order to have balanced data all series have to be truncated to the period for which observations are available for all countries in the sample. Second, one has to assume equality of coefficient across countries, which may be an untenable assumption. For these reasons, I have studied each country separately. The present paper reports on the empirical results for the United States although occasionally I will allude to the similarity of results obtained for other countries.

3. Income Inequality and Growth within a VAR Model

We define growth rate as

$$(1) \quad \Delta \ln(y_t) = \ln(y_t) - \ln(y_{t-1})$$

where y_t is the real GDP in year t , and we use the gini coefficient (g) as the measure of income inequality. In order to utilize the longest possible series of income inequality for the United States economy, we concentrate on the data for families dating back to 1947, which affords us 55 consistent annual observations.

The first task is to determine the nature of relationships we will be modeling. Augmented Dickey-Fuller test shows that neither $\ln(y_t)$ or $\ln(g_t)$ are stationary. Moreover, we do not detect a cointegrating relationship between the two. Therefore, the model is a VAR in first difference:

$$(2) \quad \begin{bmatrix} \Delta \ln(y_t) \\ \Delta \ln(g_t) \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} + \begin{bmatrix} A(L) & B(L) \\ C(L) & D(L) \end{bmatrix} \begin{bmatrix} \Delta \ln(y_t) \\ \Delta \ln(g_t) \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$$

where $A(L)$, $B(L)$, $C(L)$, and $D(L)$ are lag polynomials but neither contains L^0 term (more on this point below). Experiments with different lag lengths led me to conclude that the model was unstable. For instance, an equation containing both $\Delta \ln(y_{t-1})$ and $\Delta \ln(g_{t-1})$ showed a significant relationship between the gini coefficient and its lagged value. However, when the lagged GDP term was excluded, the relationship disappeared. Nevertheless, a positive relationship running from $\Delta \ln(g_{t-1})$ to $\Delta \ln(y_t)$ could be discerned. At the same time, the estimation results for the unrestricted VAR model reported in Table 1 make it clear that the model has little explanatory power.

Table 1. Estimation Results for Causality between Growth and Income Equality

Explanatory Variables	Dependent Variables	
	$\Delta \ln(y_t)$	$\Delta \ln(g_t)$
Constant	0.027 (.006)***	0.009 (0.005)**
$\Delta \ln(y_{t-1})$	0.165 (0.147)	-0.170 (0.109)
$\Delta \ln(g_{t-1})$	0.519 (0.199)**	-0.258 (0.148)*
R^2	0.120	0.072
DW	1.83	2.01

If we could take the above estimation results seriously, we should conclude that there is a positive, albeit weak, connection between the gini coefficient and economic growth. In other words, an increase in income inequality leads to a higher growth rate. But we cannot take the results seriously because of the instability of the model and the low explanatory power of the equations.

But could our failure to detect a connection be due to the fact that we are using annual data and any interaction may take less than a year to work out? In order to answer this question, we can look at simultaneity (or instantaneous causality) between the rate of growth of the gini coefficient and that of the GDP. Estimation results for this model are reported in Table 2. As it can be seen, there is a strong simultaneity between the rates of growth of GDP and that of the gini coefficient. It shows that a more equal distribution of income leads to a higher rate of growth and, conversely, a faster economic growth leads to a better distribution of income. Lagged values of $\Delta \ln(y_t)$ do not have any explanatory power for either $\Delta \ln(y_t)$ or $\Delta \ln(g_t)$. But lagged value of $\Delta \ln(g_t)$ is marginally significant in explaining the growth rate of GDP. Figures 1 and 2 depict these relationships.

Figure 1. Growth and Income Distribution in the United States: 1947 - 2001

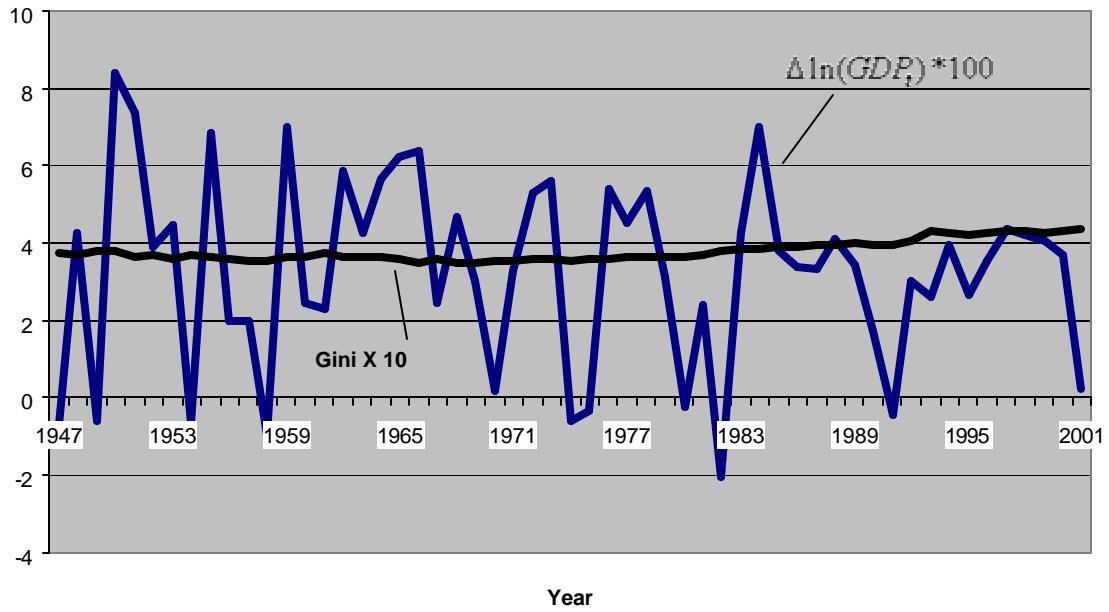
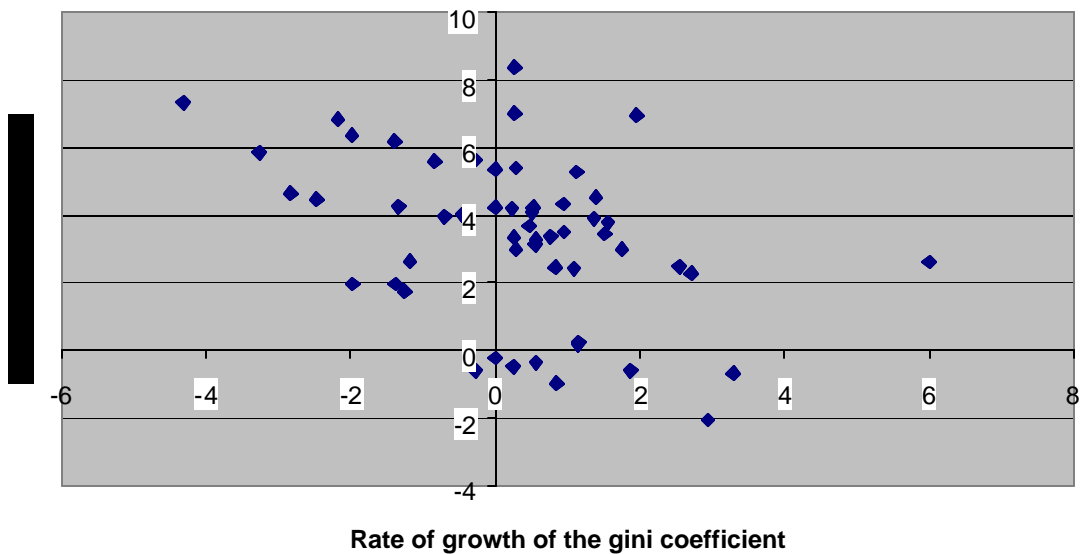


Figure 2. Growth vs. Change in Inequality in the United States: 1948 - 2001



It is clear from Fig. 1 that from 1947 to the late 1960s income distribution in the United States became more equal. Indeed the gini coefficient went from 0.376 in 1947 to 0.348 in 1968. During

the same period, the average annual growth rate of GDP was 4.1%. From 1969 to 2001 the gini coefficient rose from 0.348 to 0.435 while the average annual growth rate declined to 3.0%. The same point is depicted in the Fig. 2, which shows the relationship between $\Delta \ln(y_t)$ and $\Delta \ln(g_t)$.

Many explanations are put forward for the decline in the long-term growth rate of the GDP in the United States. Little attention, however, is devoted to the change in income distribution in the same period. Of course, one can conjure up all sorts of explanations from labor force participation of women and minorities to simply discarding as trend change any uncomfortable fact. But since the same pattern is observed in other countries very different from the United States in their structure and history, the connection between a move to a less equal distribution of income and lower rates of growth is at least worth being raised as a question.

Table 2. Estimation Results for Instant Causality between Growth and Income Equality

Explanatory Variables	Dependent Variables			
	$\Delta \ln(y_t)$		$\Delta \ln(g_t)$	
Constant	0.034 (0.003)***	0.035 (0.003)***	0.016 (0.005)***	0.013 (0.004)***
$\Delta \ln(y)$			-0.293 (0.093)***	-0.294 (0.093)***
$\Delta \ln(g_t)$	-0.503 (.174)***	-0.561 (0.174)***		
$\Delta \ln(y_{t-1})$			-0.090 (0.094)	
$\Delta \ln(g_{t-1})$	0.346 (0.173)*			
R^2	0.227	0.167	0.180	0.165
DW	1.76	1.83	2.26	2.20

4. Income Inequality and Consumption I: Refuting Kaldor's Hypothesis

As mentioned before, the old wisdom, formalized by Kaldor (1955-6), maintained that an unequal distribution of income would spur growth. The argument went thus. The rich spend less of their income on consumption and, therefore, save more. A higher rate of savings would increase the warranted rate of growth (Harrod 1939 and Domar 1946). To the extent that savings is turned into investment it would help the actual growth rate as well.

Alan Blinder (1975) put this hypothesis to test by estimating different consumption functions involving measures of income distribution. He estimated the following model:

$$(3) \quad \frac{C_t}{Y_t} = \frac{a_0}{Y_t} + a_4 + a_1 F_{1t} + a_2 F_{2t} + a_3 F_{3t} + a_5 F_{5t} + a_6 r_t + a_7 \frac{C_{t-1}}{Y_t} + e_t$$

where C, Y, and r are, respectively, consumption, disposable personal income, and real rate of interest. F_i (i=1, ..., 5) are the shares of total income received by the *i*th quintile of families; one denoting the lowest and five the highest income brackets. Since

$$(4) \quad \sum_{i=1}^5 F_{it} = 1$$

the 4th group is dropped to avoid multicollinearity. The estimation results for this equation could not be justified by any rationale. There may have been multicollinearity between F_i 's and the number of observations were too few to estimate so many parameters. He then estimated a more parsimonious model involving a summary measure of income distribution:

$$(5) \quad \frac{C_t}{Y_t} = \frac{b_0}{Y_t} + b_1 + b_2 G_t + b_3 r_t + b_4 \frac{C_{t-1}}{Y_t} + n_t$$

where G is a measure of income distribution and for the purpose of this paper, the gini coefficient.

Table 3 reproduces the estimation results of one of the equations reported by Blinder as well as an updated estimation in which I extended the period from 1969 to 2001 adding more than 30 observations. Blinder estimated a large number of equations but all reached the same conclusion. Either income distribution had no effects on consumption or a more equal distribution of income had a negative effect on consumption. Thus, in this paper I only concentrate on the equation where Blinder used the gini coefficient as the measure of income inequality.

Table 3. The Effect of Income Distribution on Consumption

Explanatory Variables	Estimation Results	
	Blinder	Current Paper
Constant	0.371 (4.1)	0.574 (7.702)
1/Y	-9.48 (-3.0)	21.491 (0.724)
C_{-1}/Y	0.631 (10.9)	0.219 (2.713)
r	-0.0035 (-3.5)	0.002 (2.652)
G	0.072 (0.3)	0.323 (1.931)
\hat{r}	0.14 (.6)	0.741 (6.457)
R^2	0.947	0.819
Sample Period	1949-52, 1954-68	1947-2001

In addition to using many more observations, my estimation differs from that of Blinder in the measure of real interest rate. He constructed a nominal savings rate “as a weighted average of the rates paid by commercial banks on time deposits, by savings and loan associations, and by mutual savings banks” (p.458). Then he subtracted the expected rate of inflation—formed by using an

adaptive expectation model— from the nominal rate to get the real rate of interest. This measure is irrelevant for my sample period. I simply took a one-year Treasury bill rate and subtracted to actual rate of inflation to get a proxy for the real rate of interest.

Not surprisingly my results differ from those of Blinder. But I still found the effect of the gini coefficient on consumption to be positive. In other words, a more equal distribution of income leads to a lower average propensity to consume. I do not want to dwell on these results, because the current literature on consumption prefers a logarithmic form and Blinder's paper was written long before advances in time series analysis made during the last quarter of century. The main point was to follow up on his study and show that his findings were neither a fluke nor a failure.

5. Income Inequality and Consumption II: Random Walk and Error Correction

Following the works of Davidson, Srba, and Yeo (1978), Hall (1978 and 1988), and Molana (1991), I looked for a parsimonious model of consumption incorporating both the random walk and error correction features. First, I did not find any evidence of cointegration between consumption and disposable personal income. Second, it turned out that consumption was sensitive to inflation but not nominal rate of interest. After testing several specifications, the following model seems to stand out:

$$(6) \quad \Delta \ln(C_t) = \mathbf{b}_0 + \mathbf{b}_1 \Delta \ln(Y_t) + \mathbf{e}_t$$

Now the question is how to incorporate income distribution into this model. One way would be to assume different elasticities of consumption for different income groups, and write

$$(7) \quad C_t = A \prod_{i=1}^5 Y_i^{b_i} e^e$$

The maximum consumption is reached at the point when the share of each income group is proportional to its income elasticity of consumption \mathbf{b}_i . This can be easily adduced by maximizing (7) subject to the constraint

$$(8) \quad \sum_{i=1}^5 Y_i = Y$$

In particular, any redistribution of income from groups with low income elasticities of consumption to those with a higher \mathbf{b} 's would increase aggregate consumption. Taking the logarithm of both sides of (7) and letting $\mathbf{a}_i = Y_i / Y$ represent the income share of the i th quintile, we have

$$(9) \quad \ln C_t = \mathbf{b}_0 + \mathbf{b}_1 \ln(Y_t) + \sum_{i=1}^5 \mathbf{b}_i \ln(\mathbf{a}_i) + \mathbf{e}_t$$

where $\mathbf{b}_0 = \ln(A)$ and $\mathbf{b}_1 = \sum_i \mathbf{b}_i$. Assuming that the mean and variance of \mathbf{b}_i 's and the correlation coefficient between $\ln(\mathbf{a}_i)$'s and \mathbf{b}_i 's are constant and approximating the standard deviation of $\ln(\mathbf{a}_i)$'s by the logarithm of the gini coefficient, we can write

$$(10) \quad \ln C_t = b_0' + b_1 \ln(Y_t) + b_2 \ln(G_t) + e_t$$

The final result is reported in Table 4 below. Since all variables are nonstationary, I estimated the equations in the first difference, thus, in all equations the dependent variable is $\Delta \ln(C_t)$. As can be seen, $\Delta \ln(G_t)$ turns out to have a statistically insignificant effect on consumption. This may be due to simultaneity between disposable personal income and the gini coefficient (see Section 3 above); using lagged values of $\Delta \ln(G_t)$ we could try to avoid this problem. Only $\Delta \ln(G_{t-1})$ turned out to be statistically significant, albeit at the 10% level. Its coefficient, however, is positive, meaning that a more unequal distribution of income results in higher consumption. Thus, the evidence is overwhelming against the old wisdom that a more equal distribution of income leads to a lower rate of savings.

Table 4. The Effect of Income Distribution of Consumption within a Random Walk Model

Explanatory Variables	Eq. 1	Eq. 2	Eq. 3
Constant	0.009 (0.003)***	0.008 (0.003)**	0.009 (0.003)***
$\Delta \ln(y_t)$	0.739 (0.080)***	0.760 (0.085)***	0.733 (0.077)***
$\Delta \ln(G_t)$		0.066 (0.090)	
$\Delta \ln(G_{t-1})$			0.148 (0.081)*
R^2	0.624	0.628	0.682
DW	2.04	2.13	1.99

6. Concluding Remarks

This paper has provided empirical support for two hypotheses. First, there is a two-way positive relationship between a more equal distribution of income and a higher rate of economic growth. In other words, we have a virtuous circle where policies that promote economic equality encourage growth and vice versa. Second, a more equal distribution of income does not reduce aggregate savings. It is important to note that we have provided this evidence on the basis of high-quality consistent time series data covering more than half a century. Moreover, the results are consistent with those obtained for other countries whose economies are structurally quite different from that of the United States. These findings have important ramifications for both academic research and policy.

It is noteworthy that despite its importance, the subject of income distribution and its connection to growth get short shrift in the macroeconomics and growth literature. The most popular macroeconomics graduate textbook (Romer 2001) does not mention the subject. Neither does one of the most comprehensive books on growth theory (Barro and Sala-I-Martin, 1995). Even in his collection of popular essays Barro (2002) briefly talks about inequality and growth (Pp.101-4) in an essay wedged between “Eastern Germany—A Lesson in Welfare Dependency” and “Democracy in the New Congo?” One wonders if economists are embarrassed to talk about the

subject because they are still holding to the old wisdom and the trade-off between growth and equality. Perhaps it is time for a change of attitude.

Policies designed to promote growth need not be defended against the charge that they would worsen income distribution. On the other hand, given a choice between two policies aimed at growth, the one favoring a more equitable distribution of income should be preferred. An example would be a tax cut. Cutting taxes would promote growth, but the one aimed at low and medium brackets would be preferable as they would doubly benefit growth. Needless to say, the issues raised here are important enough to warrant further studies.

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