The importance of the "trickle-down" effect of economic growth is a key issue in policy debate regarding tax reform, government expenditures, and efficiency-equity tradeoffs. For this reason, a recent study by Thornton, Agnello, and Link (1978) examining the relationship between poverty and economic growth from 1947 to 1974 deserves careful review. The authors (hereafter TAL) show that the trickle-down effect of economic growth on poverty, defined using a fixed threshold, is significantly less in the post 1963 period than in the 1947-1963 period. They conclude that trickle down has "petered out" and predict it will vanish in the future (pp. 386, 394). Moreover, they argue that there has been no statistically significant trickle-down effect in the post 1963 period for any demographic group when a definition of poverty using an increasing threshold is used. TAL draw what they regard as an obvious policy implication: "Since primary reliance on future economic growth to reduce poverty will be largely unsuccessful, expanded programs directed specifically at poor families will be required if poverty is to be eliminated" (p. 394).

The purpose of this note is to show that TAL's results are sensitive to the particular specification of their model and that their specification may be inappropriate. In particular, the finding that trickle down has petered out result directly from their use of a questionable dependent variable. Reestimation of the model (with their data) using an alternative dependent variable indicates that there exists no significant evidence that the relationship between poverty and economic growth has changed in the post 1963 period. In addition to challenging the validity of TAL's empirical results, this note questions the interpretation and policy implications drawn from their analysis.

I. THE TAL MODEL

TAL estimate the following regression equation:

$$\Delta P = a + b_1\%AGNP + b_2U + b_3\%ATR + b_4D\cdot\%AGNP$$

where $\Delta P$ is the change in the incidence of poverty, calculated as the percentage of families below some threshold income level. The poverty variable is calculated using both a fixed poverty threshold ($3128$ in

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1963 prices) and a semi-relative threshold (adding or subtracting to $3128 sixty percent of the percentage change from 1963 in real median family income). The variable \( \% \Delta GNP \) is the percentage change in real GNP per capita; \( D = 1 \) in 1964-1974 and 0 otherwise so that \( \Delta P/\% \Delta GNP = b_1 + b_4 D; \) \( U \) is the unemployment rate; and \( \% \Delta TR \) is the percentage change in real transfer payments per capita.\(^1\) Regressions utilizing the poverty variables with both fixed and semi-relative thresholds are estimated for all families and separately for families by the race, sex, and age of heads.

II. CRITICISMS

Criticisms of the TAL study fall into the following four categories:

1. A serious weakness of the TAL model is their use of a dependent variable measuring the absolute change in the incidence of poverty. For example, TAL would regard a change in poverty from 20 to 10 percent as equivalent to a change from 10 percent to zero. It is hardly surprising that they find trickle down petering out, given that the poverty base is shrinking. For instance, let’s assume that by a constant trickle down effect we mean that changes in real growth bring about equal dollar increases in all family incomes. Only if incomes were distributed uniformly over the lower end of the distribution would economic growth then decrease poverty at a constant rate. Given that the lower tail of the income distribution is not uniformly distributed, even a constant trickle down effect of this sort would lift fewer and fewer families above the poverty line. Moreover, economic growth is more likely to cause roughly equal percentage increases in income, rather than equal dollar increases. For these reasons, it seems more desirable to have a dependent variable that measures changes in poverty relative to its base, rather than the absolute change in poverty.

We adopt a percentage change in poverty variable, \( \% \Delta P \), so that changes from, say, 20 to 10 percent and from 10 to 5 percent are treated similarly. While one cannot rigorously test the appropriateness of alternative dependent variables, the use of a percentage change in poverty variable seems more reasonable, most particularly when poverty is measured with an increasing threshold.\(^2\) At the least, TAL should have estimated this model using their alternative dependent variable before announcing the death of trickle down.

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1. TAL admit that their choice of 1964 as the beginning date for the structural shift in trickle down resulted in the highest value of the t statistic on the \( D \cdot \% \Delta GNP \) coefficient (p. 390n). TAL utilize the national unemployment rate, rather than the unemployment rate by demographic group, in each of their regressions.

2. Because the dependent variables, \( \Delta P \) and \( \% \Delta P \), are in different units, comparison of \( R^2 \)'s is not an appropriate test of functional form. The best known test for alternative functional forms is the Box-Cox test comparing a linear form with a log-linear transformation. However such a test is not applicable for this model.
Below we compare the regressions on all families using the fixed threshold and semi-relative threshold measures of poverty for both TAL’s dependent variable, ΔP, and the %ΔP dependent variable preferred here. Regression results by demographic group, using %ΔP as the dependent variable, are reported in Table I. The TAL data were kindly furnished by the authors.3

**Fixed Threshold**

(1) \[ ΔP = \]
\[
-1.891 - .354\cdot ΔGNP + .395U - .036\cdot ΔTR + .212D\cdot %ΔGNP
\]
\[
(-5.92)^* (2.71)^* (-1.81) (2.70)^*
\]
\[ R^2 = .70 \quad D−W = 1.61 \quad F = 4.55^* \]

(2) \[ %ΔP = \]
\[
-7.989 - 1.163\cdot ΔGNP + 1.639U - .127\cdot ΔTR + .127D\cdot %ΔGNP
\]
\[
(-4.56)^* (2.64)^* (-1.50) (.38)
\]
\[ R^2 = .67 \quad D−W = 1.57 \quad F = 13.36^* \]

**Semi-Relative Threshold**

(3) \[ ΔP = \]
\[
-.683 - .198\cdot ΔGNP + .177U - .015\cdot ΔTR + .110D\cdot %ΔGNP
\]
\[
(-4.26)^* (1.57) (-.94) (1.79)
\]
\[ R^2 = .54 \quad D−W = 1.59 \quad F = 2.93 \]

(4) \[ %ΔP = \]
\[
-3.330 - .834\cdot ΔGNP + .847U - .062\cdot ΔTR + .361D\cdot %ΔGNP
\]
\[
(-3.74)^* (1.56) (-.83) (1.23)
\]
\[ R^2 = .50 \quad D−W = 1.53 \quad F = 3.63 \]

The F statistics, defined in Table 1, test for the significance of trickle down in the post 1963 period (i.e., \( H_0: b_1 + b_4 = 0 \)), and an asterisk indicates significance at the .05 level.

Using ΔP as the dependent variable, TAL conclude that trickle down is significantly weaker in the post 1963 period (i.e., the coefficient on \( D\cdot %ΔGNP \) is positive and significant) for all families, whites, males, and the young (those under 65) when using a fixed poverty threshold, and that trickle down has significantly decreased for males when using a

3. TAL’s results could not be exactly replicated, but the differences are trivial. All regression results presented in this paper use OLS. Most of the D–W statistics lie in the uncertain range. Because positive autocorrelation causes the t statistics to be biased upward, our finding that the coefficient on \( D\cdot %ΔGNP \) is insignificant when %ΔP is the dependent variable is reinforced. Results using the Cochrane-Orcutt estimating procedure are quite similar.
# Table 1
Regression Results With \%ΔP As Dependent Variable and TAL Explanatory Variables
1947-1974

<table>
<thead>
<tr>
<th>Group</th>
<th>Constant</th>
<th>%ΔGNP</th>
<th>Exogenous Variables*</th>
<th>%ΔTR</th>
<th>D·%ΔGNP</th>
<th>R²</th>
<th>D-W</th>
<th>F*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Threshold</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Families</td>
<td>-7.529</td>
<td>-1.217</td>
<td>-1.519</td>
<td>-0.104</td>
<td>0.086</td>
<td>0.61</td>
<td>1.47</td>
<td>11.51*</td>
</tr>
<tr>
<td></td>
<td>(-4.06)*</td>
<td>(2.08)*</td>
<td>(-1.04)</td>
<td>(-0.04)</td>
<td>(-0.22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonwhite</td>
<td>-9.979</td>
<td>-0.697</td>
<td>1.956</td>
<td>-0.126</td>
<td>-0.132</td>
<td>0.52</td>
<td>1.91</td>
<td>6.95*</td>
</tr>
<tr>
<td></td>
<td>(-2.47)*</td>
<td>(2.84)*</td>
<td>(-1.34)</td>
<td>(-0.36)</td>
<td>(-0.35)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>-8.604</td>
<td>-1.388</td>
<td>1.769</td>
<td>-0.204</td>
<td>0.128</td>
<td>0.68</td>
<td>1.62</td>
<td>16.07*</td>
</tr>
<tr>
<td></td>
<td>(-4.91)*</td>
<td>(2.57)*</td>
<td>(-2.17)</td>
<td>(-0.35)</td>
<td>(-0.35)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-4.603</td>
<td>0.095</td>
<td>0.743</td>
<td>0.103</td>
<td>-0.638</td>
<td>0.13</td>
<td>2.35</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>(.22)</td>
<td>(.71)</td>
<td>(.71)</td>
<td>(-1.12)</td>
<td>(-1.12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>-10.447</td>
<td>-1.382</td>
<td>2.204</td>
<td>-0.118</td>
<td>0.041</td>
<td>0.62</td>
<td>1.18</td>
<td>10.94*</td>
</tr>
<tr>
<td></td>
<td>(-3.79)*</td>
<td>(2.49)*</td>
<td>(-0.97)</td>
<td>(.09)</td>
<td>(.09)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old</td>
<td>-.349</td>
<td>-0.338</td>
<td>-0.091</td>
<td>-0.134</td>
<td>(-0.22)</td>
<td>0.17</td>
<td>1.92</td>
<td>2.62</td>
</tr>
<tr>
<td></td>
<td>(.107)</td>
<td>(-1.2)</td>
<td>(-1.28)</td>
<td>(-.55)</td>
<td>(-.55)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Semi-Relative Threshold** |          |         |                       |       |           |     |     |     |
| White Families   | -2.726   | -.835   | .729                  | -.039 | .280      | 0.40| 1.57| 3.19   |
|                  | (-2.99)* | (1.07)  | (.07)                 | (-.42) | (.76)     |     |     |     |
| Nonwhite         | -8.318   | -.519   | 1.636                 | -.096 | .436      | 0.28| 2.35| .06    |
|                  | (-1.64)  | (2.12)* | (-0.91)               | (1.05) | (1.05)    |     |     |     |
| Male             | -3.373   | -1.142  | .933                  | -.142 | .487      | .55 | 1.74| 5.24*  |
|                  | (-4.44)* | (1.49)  | (-1.65)               | (1.44) | (1.44)    |     |     |     |
| Female           | -2.245   | .301    | .428                  | .095  | -0.427    | 0.06| 2.22| .08    |
|                  | (.73)    | (.42)   | (.70)                 | (-.79) | (-.79)    |     |     |     |
| Young            | -4.891   | -1.076  | 1.210                 | -.022 | .313      | .53 | 1.12| 5.16*  |
|                  | (-3.56)* | (1.65)  | (-.22)                | (.79) | (.79)     |     |     |     |
| Old              | .601     | .190    | -.292                 | -.076 | -0.013    | .12 | 2.23| .30    |
|                  | (.65)    | (.41)   | (.78)                 | (.03) | (.03)     |     |     |     |

* t-values are in parentheses. * Indicates a .05 level of significance for the coefficient using a two-tailed test.

* The F statistic presents tests for the significance of the trickle-down effect in the post 1963 period (i.e., $H_0: b_1 + b_2 = 0$, where $b_1$ and $b_2$ are coefficients of the variables $\%ΔGNP$ and $D·\%ΔGNP$ respectively). $F(1, n-k)$ is calculated as $(b_1 + b_2)^2/(\text{var}b_1 + 2\text{cov}b_1b_2 + \text{var}b_2)$. 
semi-relative threshold. However, empirical support for TAL's hypothesis vanishes when $\% \Delta P$ is used as the dependent variable. The coefficient on $D \cdot \% \Delta GNP$ is not statistically significant for any demographic group, using either the fixed or semi-relative poverty threshold. Point estimates from (2) and (4) indicate that percentage increases in real per capita GNP during the post 1963 period have brought about equal percentage decreases in absolute poverty ($b_1 + b_4 = -1.036$), and half as large decreases in semi-relative poverty ($b_1 + b_4 = -0.473$), though this latter effect is not quite statistically significant.

In addition, whereas TAL find trickle down to be statistically significant in the post 1963 period only for male-headed families and all families using a fixed threshold, our results in Table 1 indicate that the trickle-down effect on absolute poverty was significant during this period for all groups except families headed by females or the old. Using the semi-relative measure, we find that economic growth significantly decreases poverty among families headed by males or with heads under 65. TAL's conclusion that trickle down has petered out during the post 1963 period appears premature.

2. One of the more interesting parts of the TAL paper is their disaggregation of results by race, sex, and age. Their results, as well as those presented here, suggest that economic growth has little direct effect on families headed by females or the elderly. While TAL fail to note the point, evidence that an increasing percentage of poor families have female or elderly heads makes their hypothesis that trickle down is diminishing quite plausible. For instance, the percentage of poor persons in families with female heads increased from 26 percent in 1959 to 49 percent in 1974 (U.S. Bureau of the Census (1976, Table 1)). While dependency on transfer income has increased dramatically among the elderly, their share among the official poor, defined after cash transfers, has remained fairly stable. In short, analysis of the effects of economic growth on poverty requires the separation of two factors: changes over time in the demographic composition of the poverty population, and changes over time in the relationship between poverty and growth within given demographic groups.

Unfortunately, TAL's method of disaggregation prevents final conclusions from being drawn. Given that poverty among female-headed and elderly families appears virtually unrelated to macroeconomic activity, these groups should be excluded from analyses comparing the effects of other characteristics. For instance, nonwhite families may appear to be less sensitive to economic growth than are whites because of a disproportionate number of female-headed households. TAL's separate regressions for all nonwhite families and all white families make racial comparisons difficult, whereas, separate regressions for families with nonwhite male heads under 65 and families with white male heads under 65 would allow inferences to be drawn regarding differences by race.
Only a more appropriate disaggregation, in which the effects of race, sex, and age are not mixed will make possible the type of conclusions TAL wish to draw form their analysis.

3. TAL's policy implication regarding the greater need to rely on programs aimed directly at the poor does not follow from their analysis. Their variable measuring transfer payments is statistically insignificant in all but one of the regressions, suggesting (incorrectly) that increased transfers do not decrease poverty. While TAL correctly note (p. 393) that \( \% \Delta TR \) includes many transfers to the non-poor, and excludes transfers in-kind, they fail to note the effect that omission of transfers in-kind have on the measurement of their dependent variable. Browning (1976), (1979), Smeeding (1977), (1979), and others find that inequality in the distribution of money income greatly overstates inequality in net real income, and that the trend towards equality in the distribution of net real income has been more pronounced than the trend in the distribution of money income. Whereas transfers in-kind were virtually non-existent during the 1947-1963 period, by 1974 transfers in-kind (excluding education) constituted about 56 percent of all transfers to the poor (U.S. Department of H.E.W. (1974, Table 1)). If such transfers were included as income, poverty would have decreased more rapidly during the post 1963 period than TAL's measures indicate. Indeed, a Congressional Budget Office study using 1976 microdata finds that transfers comprise 96 percent of the total income to families in the bottom quintile (many of whom are not officially poor), and 30 percent of these transfers are in-kind.4

Before concluding that greater reliance must be placed on programs aimed directly at the poor, one must measure correctly the size and impact of current programs, and evaluate the benefits and costs associated with further income redistribution. This measurement must take into account not only such things as administrative costs, but also the marginal welfare cost associated with transfers.5 Evidence from the Social Security program, AFDC, and the recent negative income tax experiments indicates that transfers have significant effects on labor supply, which in turn reduce pre-transfer incomes. Measured poverty is also affected by policy-induced increases in the number of elderly and female-headed households. Thus, a complete analysis of trickle down from which policy implications can be drawn requires time-series data on both money and non-money transfers to the poor, and estimates of the supply response to these transfers.6

4. Congressional Budget Office (1977, Table A-4). The C.B.O. report counted food stamps, child nutrition, housing assistance, Medicare, and Medicaid, but excluded all other transfers in-kind. Browning (1979) reports similar results from a study by him and William Johnson which utilizes the same data base.

5. Browning (1978) provides estimates of the marginal welfare costs of income redistribution.

6. In a recent paper, Gottschalk (1978) attempts to assess the relative importance of transfers and economic growth on poverty reduction during the 1963-1973 period. He simply assumes that supply responses to transfers are zero, and fails to even mention the existence of transfers in-kind.
4. Specification of the TAL model does not allow for measurement of the total effect of economic growth on poverty. The estimate, \( b_1 + b_4 D \), measures the partial effect of \( \% \Delta GNP \) on poverty, holding constant the unemployment rate and change in real transfers. However, two major channels through which growth affects poverty are the labor market and government finance, the rate of economic growth being a determinant of both unemployment and the level of real transfers. An accurate estimation of the total effects of \( \% \Delta GNP \) on poverty requires a fully specified model in which all of the determinants of unemployment and transfers, in addition to economic growth, are first identified and estimated.

Identification of the channels through which economic growth affects incomes may be particularly relevant in drawing policy implications. Recent studies find that the pre-transfer distribution of income has become less equal over time and that the poor are increasingly dependent on transfers. However, even if the poor were completely dependent on transfer income, so that direct trickle down through the labor market is nonexistent, economic growth would still be important in providing the means for increasing real transfers over time.

The evidence presented here indicates that trickle down had not petered out during 1964-1974, nor was it significantly different than during the 1947-1963 period. Economic growth acted to reduce significantly the incidence of poverty for all families, except those headed by females and the elderly. However, changes in the post 1974 relationship between economic growth and poverty would not be surprising given the changing demographic composition of the poor and an increased dependence on transfer income. Empirical results from the TAL model do not provide unambiguous policy implications. The case for expanding transfers targeted directly to the poor rather than reliance on economic growth continues to be an open question.

7. For instance, Gottschalk (1978) uses just the unemployment rate as a measure of economic growth. Our criticism of TAL may not be serious since \( \% \Delta GNP \) is not highly correlated with either \( U \) or \( \% \Delta T \) using annual data. However, \( \% \Delta GNP \) is highly correlated with \( \% \Delta U \) and the level of transfers is highly correlated with the level of GNP. While in any given year some transfer payments may be counter-cyclical and vary inversely with \( \% \Delta GNP \), increases in real GNP over time make possible increases in real transfers. During the 1947-1974 period real GNP increased 80 percent, while per capita real transfers increased 290 percent.
REFERENCES


