Journal of Agricultural and Applied Economics, 30,2(December 1998):325–337

Regional Economic Growth and Income Distribution: County-Level Evidence from the U.S. South

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ABSTRACT

Changes in income distribution are estimated for the U.S. South over the 1970 and 1980 decades using Gini coefficients for county-level, real family income. To explicitly investigate causal relationships between economic growth and inequality, a two-stage least squares model was estimated. In the 1970s, more rapid increases in inequality were associated with a reduced income growth rate, ceteris paribus, while in the 1980s, the opposite was true. Faster rates of income growth were associated with more rapid increases in inequality during the 1980s, but rates of income growth had no effect on changes in inequality during the 1970s.

Key Words: causality, economic growth, inequality, U.S. South.

In recent years, the relationship between economic growth and income distribution has received renewed attention. Kuznets' hypothesis that the relationship between inequality and income growth follows an inverse-U has been supported by some cross-sectional studies (Ram 1995; Tsakloglou), but refuted by others (Ram 1991; Anand and Kanbur). Research following Kuznets' work attempted to explain how economic growth affects income distribution. More recent research also emphasizes the effect of income distribution on economic growth (Persson and Tabellini).

Unlike Kuznets and the authors who followed, we specify a simultaneous- rather than a single-equation model of economic growth and income inequality. We examine the joint effects on growth and inequality of industrial structure, labor force and individual characteristics, human capital stocks, and other determinants of economic growth and income distribution. Because previous econometric studies of the relationship between economic growth and income distribution fail to control for reverse causality between inequality and growth, these studies suffer from potential specification bias. To investigate causality between these two variables in long-run equilibrium, we model family income growth—which we define as our measure of economic growth—as a function of changes in family income distribution; in addition, we estimate the impacts of changes in family income distribution on income growth patterns.

Data used in the analysis cover the 1970 and 1980 decades and 1,257 counties in the U.S. South.[1] The South is of particular interest

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The authors thank Mark Berger, Angelos Pagoulatos, John van Willigen, and two anonymous reviewers for valuable comments.

[1] States included are Alabama, Arkansas, Florida,

because of rapid labor and industrial growth during the 1970s and 1980s (Newman). By using county-level data, we avoid the inter-country data comparability and structural problems discussed by Saith. Since we use data for both the 1970 and 1980 decades, we are able to determine whether the intertemporal relationship between economic growth and family income inequality has remained stable over time. In addition to testing for causality between growth and inequality, our objectives include identifying and explaining the causes of income divergence over the last 20 years as well as predicting the behavior of income growth and inequality in the future.

The study is organized as follows. We first outline the method for estimating a Gini coefficient of concentration using grouped family income data. We then construct a two-equation model treating economic growth and change in income inequality as simultaneously determined. Last, we report and discuss the empirical results.

Estimation of Income Inequality

Several authors have analyzed the distribution of income using a Lorenz-based inequality measure.[2] The most commonly employed measure of inequality is the Gini coefficient, which is a summary statistic for the Lorenz curve. If all units have the same income, the Gini coefficient is zero (perfect income equality); the coefficient is one when only a single individual earns all of the income (perfect income inequality).

To estimate the Gini coefficient, we use a technique developed by Kakwani and Podder:

$$GINI = 2a(\sqrt{2})^{1+\alpha+\beta}B(1 + \alpha, 1 + \beta),$$

where $B(1 + \alpha, 1 + \beta)$ is the beta function, and parameters a, α, and β are estimated from:

$$\log(k_{t,q}) = \log(a) + \alpha \log(n_{t,q}) + \beta \log(\sqrt{2} - n_{t,q}) + u_1,$$

where $k_{t,q}$ and $n_{t,q}$ are empirically estimated frequency distributions of the number of families (family units) and income ranges, q denotes the qth income group, t is an index for time, and u_1 is a random error vector (the properties of which are discussed in Kakwani and Podder).

Modeling Economic Growth and Income Inequality

Income Growth Equation

Solow's seminal work, later extended by Barro, generated interest in empirical economic growth models. The growth model estimated here analyzes determinants of county-level real family income growth, $\Delta Y_t = \ln(Y_{t+10}/Y_t)/10$, where Y_t is the level of family income in period t = 1970 or 1980. The level of family income at the beginning of each decade is included [in log form, $\ln(Y_t)$] as a regressor to control for income convergence, based on the neoclassical growth model (Barro; Goetz and Hu). Following recent studies on the growth-inequality relation (e.g., Persson and Tabellini), *change* in the Gini coefficient, $\Delta GINI_t = \ln(GINI_{t+10}/GINI_t)/10$ (where $GINI_t$ is the level of inequality in period t), is included to test for the hypothesized simultaneity between income growth and inequality. Family income growth is hypothesized to depend also on industrial composition—reflecting local shifting into and out of expanding and declining industries—as measured by the percentage of earnings in each sector.

Educational attainment is a proxy for the stock of human capital, and measures labor productivity. Higher productivity is expected to be associated with faster economic growth. The percentage of the population 25 years or older with at least a high school degree is used as a measure of human capital stocks. Labor market variables also include real wages, mea-

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Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and West Virginia.

[2] See, for example, Kennedy and Nord; and Persky and Tam. The Lorenz curve is the relationship between the cumulative percentage of total income within an economy and the cumulative percentage of income received when units are arranged in ascending order according to incomes.

sured as total wage-and-salary earnings per wage-and-salary position. If average wages reflect labor costs, wage rates will negatively affect economic growth. Previous studies have found mixed support for this assertion (e.g., Romans and Subrahmanyam).

Previous studies of economic growth also controlled for labor power by including unionization rates and right-to-work legislation. Right-to-work laws are determined by state legislatures, and consequently do not vary across counties within a state. Also, data on rates of union membership are not available at the county level, so we use statewide values for these variables at the county level. If labor unions are more likely to strike or command higher wages and benefits, fewer firms will locate in states where unions are strong. Newman found a negative impact of unionism on economic activity, and a positive impact for right-to-work laws. However, Freeman and Medoff argued that a highly unionized labor force may raise productivity through higher capital/labor ratios, higher quality employees, and lower labor turnover which, in turn, stimulates economic growth.

The model estimated here also includes per capita local taxes and government expenditures as regressors. Higher local taxes reduce factor demand, thereby discouraging business location and depressing economic growth, assuming constant public expenditures. Demographic characteristics in the model include an indicator variable that assumes a value of one for metropolitan counties and zero otherwise. Urban counties generally are considered to be more attractive to firms than rural counties due to agglomeration economies and other locational advantages; therefore, "urbanness" is expected to be positively related to economic growth.

The share of minorities in the county population controls for the effect of racial composition on economic growth. All else equal, we expect this variable to negatively influence growth, reflecting reduced opportunities available to minority families. In addition, we include regional indicator variables to capture other spatial effects that vary across regions of the U.S.

The economic growth equation is specified as:

$$
\begin{aligned}
(1)\quad \Delta Y_{c,\Delta t} = {} & \alpha_0 + \gamma_1 \ln(Y_{c,t}) + \gamma_2 \Delta GINI_{\Delta t} \\
& + \sum_{i=1}^{9} \beta_i EARNPC_{c,t,i} + \delta_1 HSC_{c,t} \\
& + \delta_2 WAGE_{c,t} + \delta_3 UNION_{c,t} \\
& + \delta_4 RWK_{c,t} + \delta_5 EXP_{c,t} + \delta_6 TAX_{c,t} \\
& + \delta_7 METRO_{c,t} + \delta_8 MINOR_{c,t} \\
& + \delta_9 DSA_c + \delta_{10} DESC_c + \epsilon_{c,t},
\end{aligned}
$$

where t = 1970 or 1980, and c indexes each county. $EARNPC_{c,t}$ = percentage of earnings in agricultural services, forestry, and fishing; mining; construction; manufacturing; transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services (government is the omitted category). $HSC_{c,t}$ = percentage of persons 25 years old and over who have completed 12 years or more of school, $WAGE_{c,t}$ = real wage rate, $UNION_{c,t}$ = unionization rate, $RWK_{c,t}$ = "right-to-work" county, $EXP_{c,t}$ = local public expenditures per capita, $TAX_{c,t}$ = local tax revenues per capita, $METRO_{c,t}$ = metropolitan county, $MINOR_{c,t}$ = percentage of ethnic minorities in the county population, DSA_c = an indicator variable with a value of one for counties in the South Atlantic states and zero otherwise, $DESC_c$ = an indicator variable with a value of one for counties in the East-South Central states, $\epsilon_{c,t}$ = an error term for the cth county in year t, Greek letters denote parameters to be estimated, and the remaining variables are as defined previously.

Income Inequality Equation

As in the case of economic growth, we hypothesize that income inequality converges to an equilibrium path that is a function of initial conditions. Thus, the Gini coefficient at the beginning of the decade is included to test for convergence in inequality across counties over time. Variables affecting economic growth also may affect income inequality across counties. The industrial mix within counties, for example, affects both income inequality

and income growth. Ryscavage and Henle argue that higher manufacturing, construction, and government sector employment shares are associated with reduced income inequality. Construction firms pay comparatively high wages to semi-skilled or even unskilled workers in comparison with other private sector firms, thus potentially reducing income inequality. When compared with the private sector, wages of government workers tend to be relatively homogeneous, thereby reducing income disparities among state, local, and federal employees. In contrast, service sector firms offer both low- and high-wage jobs and tend to be associated with a bimodal income distribution.

The role of education in reducing income inequality has been examined by several authors (Bishop, Formby, and Thistle; Danziger and Gottschalk). These writers suggest that education equalizes economic opportunity and facilitates labor mobility, thereby reducing income inequality. Even so, technological changes that increase returns to education often favor high-income families whose members can afford a college education, while children from low-income families are less likely to attend college. Thus, education may increase rather than reduce income disparities over time.

Wage and salary earnings are the largest component of personal income, fluctuate most widely over time, and, according to Carlino, contribute to an ever-widening income distribution. Asher and DeFina argue that reduced unionization rates over the last 20 years are the primary cause of increased income inequality in the U.S. However, Rubin found a significant positive relationship between unionism (or union density, i.e., the percentage of manufacturing workers unionized) and income inequality, suggesting that unionism may lead to *greater* income inequality if unions are able to bargain for higher wages for their members relative to nonunionized workers. A related factor affecting income inequality is "right-to-work" legislation. Because union influence is reduced in right-to-work states, right-to-work legislation also may influence income inequality. Although the right-to-work variable may be positively correlated with income inequality, a negative correlation is also plausible.

Danziger and Gottschalk note that state and local taxes are generally regressive, and expected to be positively related to income inequality. Bishop, Formby, and Thistle point out that inequality positively depends on per capita property income. We hypothesize that, because of a variety of factors including job discrimination and limited economic opportunities, counties with a higher proportion of ethnic minorities have higher income inequality.

Another important demographic characteristic likely to affect income inequality is the percentage of households headed by a female. Traditionally, according to U.S. Department of Commerce (USDC)/Bureau of the Census data, these households have had disproportionately low incomes. We hypothesize that counties containing a larger share of households headed by a female will have greater income inequality, ceteris paribus (see also Danziger and Gottschalk). Earlier studies also found that incomes in rural areas are distributed more evenly than in urban areas, which justifies inclusion of a rural-urban (nonmetro-metro) indicator variable (e.g., Goetz and Debertin).

After combining these hypotheses, the estimated income inequality equation is:

$$
\begin{aligned}
(2)\quad \Delta GINI_{c,\Delta t} = {} & \alpha_1 + \gamma_3 GINI_{c,t} + \gamma_4 \Delta Y_{c,\Delta t} \\
& + \sum_{i=1}^{9} \omega_i EARNPC_{c,t,i} + \phi_1 HSC_{c,t} \\
& + \phi_2 WAGE_{c,t} + \phi_3 UNION_{c,t} \\
& + \phi_4 RWK_{c,t} + \phi_5 TAX_{c,t} \\
& + \phi_6 PROPY_{c,t} + \phi_7 MINOR_{c,t} \\
& + \phi_8 FEMHH_{c,t} + \phi_9 METRO_{c,t} \\
& + \phi_{10} DSA_c + \phi_{11} DESC_c + \epsilon_{c,t},
\end{aligned}
$$

where $PROPY_{c,t}$ = property income per capita, $FEMHH_{c,t}$ = percentage of female-headed households, and other variables are as previously defined.

The next step is to estimate a two-equation model that accounts for the effects of econom-

Table 1. Summary Statistics and Data Sources for Variables Used in the Regressions for the 1970s and 1980s

Variable	Description	1970s Mean	1970s Std. Dev.	1980s Mean	1980s Std. Dev.	Expected Sign ΔY	Expected Sign $\Delta GINI$
Dependent Variables:							
$\Delta Y_{\Delta t}$	Compound real annual family income growth rate between year t and $t + 10$: $\ln(Y_{t+10}/Y_t)/10$	0.09	0.01	0.06	0.01		
$\Delta GINI_{\Delta t}$	Compound annual change in Gini coefficient between year t and $t + 10$: $\ln(GINI_{t+10}/GINI_t)/10$	0.02	0.02	0.03	0.05		
Explanatory Variables:							
$\ln(Y_t)$	Real family income ($/capita, natural log)[a]	9.78	0.19	9.97	0.17	−	±
$GINI_t$	Gini coefficient of concentration	0.25	0.12	0.30	0.07	±	−
AG_t	Agricultural services, forestry, and fishing earnings (% of total)[b]	0.01	0.02	0.01	0.02	±	±
MIN_t	Mining earnings (%)[b]	0.03	0.07	0.04	0.09	+, −[c]	±
MFT_t	Manufacturing earnings (%)[b]	0.22	0.16	0.22	0.16	±	−
CST_t	Construction earnings (%)[b]	0.07	0.05	0.08	0.06	±	−
TSP_t	Transportation and public utilities earnings (%)[b]	0.06	0.04	0.01	0.01	±	±
WST_t	Wholesale trade earnings (%)[b]	0.03	0.03	0.04	0.03	±	±
RET_t	Retail trade earnings (%)[b]	0.12	0.04	0.11	0.03	±	±
FIN_t	Financial services earnings (%)[b]	0.03	0.02	0.03	0.02	±	±
SCE_t	Services earnings (%)[b]	0.12	0.06	0.12	0.05	±	±
HSC_t	Adults w/12 or more years of school (%)[b]	0.38	0.12	0.50	0.10	+	±
$WAGE_t$	Real wage ($100,000 per job)[d]	0.11	0.02	0.13	0.03	−	+
$UNION_t$	Unionization rate (% of manufacturing workers)[e]	0.18	0.07	0.15	0.06	±	±
RWK	Right-to-work state (yes = 1)[e]	0.80	0.40	0.80	0.40	±	±
EXP_t	Real local government general expenditures ($1,000/capita)[b]	0.80	0.30	1.04	0.43	+	
TAX_t	Real local government general tax revenues ($1,000/capita)[b]	0.25	0.21	0.33	0.30	−	+
$PROPY_t$	Property income (% of total)[b]	0.19	0.09	0.14	0.08		+
$MINOR_t$	Minority population (% of total)[b]	0.19	0.18	0.19	0.17	−	+
$FEMHH_t$	Households headed by single females (% of total)[b]	0.10	0.04	0.13	0.04		+
$METRO$	Metropolitan county (yes = 1)[f]	0.22	0.42	0.22	0.42	+	−
DSA	South Atlantic counties (yes = 1)[b]	0.34	0.47	0.34	0.47	±	±
$DESC$	East South Central counties (yes = 1)[b]	0.29	0.45	0.29	0.45	±	±

Notes: Summary statistics (unweighted) are based on 1,257 counties in the U.S. South. All monetary data are deflated using the consumer price index with base years 1982–84 = 100 (USDC/Bureau of the Census, *Statistical Abstract of the U.S.*, 1996). In the case of local government taxes and expenditures, data are not available for 1980 and 1990; instead, the years closest to the census year are chosen (1972 and 1982, respectively).

[a] *Census of the Population* (USDC/Bureau of the Census, 1970, 1980, and 1990).

[b] *Statistical Abstact of the U.S.* (USDC/Bureau of the Census, 1994).

[c] The notation "+, −" means the expected effect is positive during the 1970s and negative during the 1980s.

[d] *Regional Economic Information System* (USDC/Bureau of Economic Analysis, May 1993).

[e] *Directory of National Unions and Employee Organizations,* and *Directory of U.S. Labor Organizations* (U.S. Department of Labor/Bureau of Labor Statistics); *Statistical Abstract of the U.S.* (USDC/Bureau of the Census, various years).

[f] "Rural-Urban Continuum Codes for Metro and Nonmetro Counties, 1993" (Butler and Beale).

Table 2. Two-Stage Least Squares Regression Results for the 1970s and 1980s Growth and Inequality Models

	1970s		1980s	
Variable	$\Delta Y_{\Delta t}$	$\Delta GINI_{\Delta t}$	$\Delta Y_{\Delta t}$	$\Delta GINI_{\Delta t}$
Constant	0.457***	0.125***	0.346***	0.032**
	(17.319)	(4.951)	(10.329)	(2.523)
$\ln(Y_t)$	−0.039***	—	−0.031***	—
	(13.490)		(8.726)	
$\Delta GINI_{\Delta t}$	−0.074***	—	0.152***	—
	(9.924)		(6.866)	
$GINI_t$	—	−0.346***	—	−0.249***
		(18.140)		(17.505)
$\Delta Y_{\Delta t}$	—	0.085	—	0.353**
		(0.356)		(2.175)
AG_t	−0.002	−0.022	−0.002	0.060**
	(0.102)	(0.383)	(0.160)	(2.231)
MIN_t	0.027***	0.032*	−0.011**	0.015**
	(6.121)	(1.686)	(2.495)	(2.006)
MFT_t	0.002	0.001	0.011***	−0.007
	(0.989)	(0.084)	(4.342)	(1.589)
CST_t	0.028***	0.017	0.007	−0.003
	(3.650)	(0.929)	(1.326)	(0.398)
TSP_t	0.018***	0.040	−0.144**	0.091
	(3.082)	(0.843)	(2.130)	(0.633)
WST_t	0.006	0.046	0.001	0.039**
	(0.467)	(1.188)	(0.057)	(2.057)
RET_t	−0.018*	−0.064**	−0.019*	0.005
	(1.923)	(2.282)	(1.865)	(0.264)
FIN_t	0.029*	0.079	0.070***	0.104***
	(1.778)	(1.380)	(3.489)	(3.151)
SCE_t	0.022***	0.006	0.004	0.035***
	(4.393)	(0.373)	(0.604)	(2.655)
HSC_t	0.003	−0.006	0.046***	−0.028***
	(0.722)	(0.348)	(9.660)	(3.465)
$WAGE_t$	0.004	−0.048	−0.073***	0.141***
	(0.165)	(0.761)	(4.079)	(4.264)
$UNION_t$	0.011**	−0.111***	−0.031***	0.013
	(2.267)	(4.810)	(4.671)	(0.938)
RWK	0.002*	−0.009**	0.003***	−0.001
	(1.748)	(2.239)	(3.425)	(0.440)
EXP_t	−0.005**	—	−0.002***	—
	(2.051)		(2.995)	
TAX_t	0.011**	0.010	0.008***	0.003
	(2.139)	(1.043)	(4.342)	(1.049)
$PROPY_t$	—	0.026	—	0.038***
		(1.540)		(3.283)
$MINOR_t$	0.005***	0.001	−0.012***	−0.001
	(2.854)	(0.110)	(7.662)	(0.069)

Table 2. (Continued)

	1970s		1980s	
Variable	$\Delta Y_{\Delta t}$	$\Delta GINI_{\Delta t}$	$\Delta Y_{\Delta t}$	$\Delta GINI_{\Delta t}$
FEMHH$_t$	—	0.165***	—	0.176***
		(3.781)		(6.641)
METRO	0.005***	−0.000	0.004***	−0.002*
	(6.270)	(0.118)	(5.510)	(1.760)
DSA	−0.005***	−0.006**	0.011***	−0.009***
	(6.478)	(2.069)	(18.143)	(4.516)
DESC	−0.003***	−0.005	0.007***	−0.006***
	(4.353)	(1.569)	(9.902)	(3.305)

Notes: Numbers in parentheses are *t*-statistics. Single, double, and triple asterisks (*) denote significance at the 10%, 5%, and 1% or lower levels, respectively. Data based on 1,257 county-level observations, and White's consistent variance-covariance matrix estimates.

ic growth (increased income) on changes in income inequality as well as for the effects of changes in income inequality on growth. Explanatory variables measured at the start of each decade (1970 or 1980) are included in the respective equations to control for initial conditions. Table 1 presents variables used in the model, summary statistics, definitions, and data sources.

Estimation Results and Discussion

Previous studies have used ordinary least squares models to estimate the relationship between economic growth and income distribution. Our study improves on earlier research by accounting for simultaneity with a two-stage least squares model of economic growth and income inequality. Estimation results are reported in table 2.

Growth Model Results

The estimation results for the growth models for the 1980s and 1970s are similar, although a few notable differences emerge. Changes in the Gini coefficient ($\Delta GINI$) are negatively related to real family income growth (ΔY) in the 1970s, implying that counties with high income inequality experienced less rapid family income growth than those with low income inequality. However, family income growth is not statistically significant (below the 10% level) in explaining income inequality in the 1970s. In the 1980s, in contrast, a positive relationship emerges between family income growth and inequality. These results suggest that a structural change occurred in the relationship between income growth and inequality during the 1970s and 1980s.

The coefficient estimate for initial real family income, $\ln(Y_t)$, at the start of either decade is significant at below the 1% level and of the expected negative sign, indicating income convergence. In the 1970s, counties with more earnings in mining, construction, transportation and public utilities, finance, insurance and real estate, and services (relative to earnings in the government sector) experienced faster economic growth, while counties with more earnings in retail trade grew less rapidly. In the 1980s, counties with more earnings in manufacturing and finance, and insurance and real estate experienced faster economic growth, while counties with more earnings in mining, transportation and public utilities, and retail trade grew less rapidly. The result for mining likely reflects macroeconomic conditions in the 1970s, when the energy sector was booming, and the 1980s when it was lagging behind the rest of the economy.

Counties with more highly educated populations experienced faster income growth in the 1980s, but not in the 1970s, according to these results. The effect of educational attainment on family income growth in part may be explained by rising returns to skills in the

1980s (see, e.g., Goetz and Hu). Wage levels in 1980 have a negative impact on family income growth in the 1980s. However, wages in 1970 are not statistically associated with family income growth in the 1970s at the 10% level of significance. The coefficient estimate for unionization is positively related to family income growth in the 1970s, while the opposite is true in the 1980s, possibly reflecting declining union power and membership (Asher and DeFina) or labor productivity effects (Freeman and Medoff). Right-to-work laws positively affected income growth in both decades, suggesting that, at least for this data set, right-to-work legislation increases family income growth rates independently of unionism. These results must be interpreted with caution since, as discussed earlier, only a statewide measure of this variable is available.

Contrary to expectations, counties with higher local government expenditures experienced lower family income growth rates in both decades, while counties with higher taxes experienced faster growth. Carroll and Wasylenko report similar unexpected results for public revenues and expenditures with respect to economic growth. Higher government expenditures may crowd out private sector activity (Peden), while higher government taxes, to the extent that they are spent locally, may be associated with better public services that are not necessarily reflected in current government expenditures; these better services may in turn attract higher-income families into a community (Mofidi and Stone).

Counties with higher minority population shares experienced more rapid family income growth in the 1970s, and less rapid growth in the 1980s. In both decades, metropolitan counties experienced faster family income growth than nonmetro counties, all else equal. The regional dummy variables indicate that income growth in South Atlantic and East South Central counties was higher than in West South Central counties in the 1980s, while the reverse was true in the 1970s.

Inequality Model Results

As was true of the income growth model, some notable differences exist between the coefficients estimated for the 1970s and 1980s in the inequality equations. In the 1970s, only the mining and retail sector employment shares exerted a statistically significant effect on changes in income distribution. For the 1980s, the vector of industrial earnings shares indicates that counties with more earnings in agriculture, mining, wholesale trade, finance, insurance and real estate, and services exhibited higher family income inequality.

Educational attainment of the population had no effect on changes in income inequality in the 1970s, but it was associated with reduced inequality in the 1980s. This is consistent with the argument discussed earlier that education equalizes economic opportunity. The coefficient on average wage levels is not statistically distinguishable from zero at below the 10% level in the 1970s, but is associated in a statistically significant manner (below 1%) with higher income inequality in the 1980s. Unionization and right-to-work laws had a negative effect on family income inequality in the 1970s, but no significant impact in the 1980s.

The coefficient for per capita property income was not statistically significant in the 1970s at below the 10% level, but was unambiguously associated with increased income inequality in the 1980s. This is possibly a reflection of the increasing concentration of wealth over time evident at the national level. Counties with higher percentages of female heads of households experienced increased income inequality in both decades. In contrast, ethnic minority shares are not significant at below the 10% level in explaining income inequality in either decade, ceteris paribus.[3]

Income inequality in South Atlantic and East South Central counties is generally lower than in West South Central counties, with a

[3] The percentages of ethnic minorities in the county population and female-headed households are highly correlated (0.80). When *FEMHH* is omitted from the equation, counties with higher ethnic minority population shares show higher income inequality, while the signs and statistical significance of the other explanatory variables do not change materially. This is discussed in more detail below in the context of interaction terms.

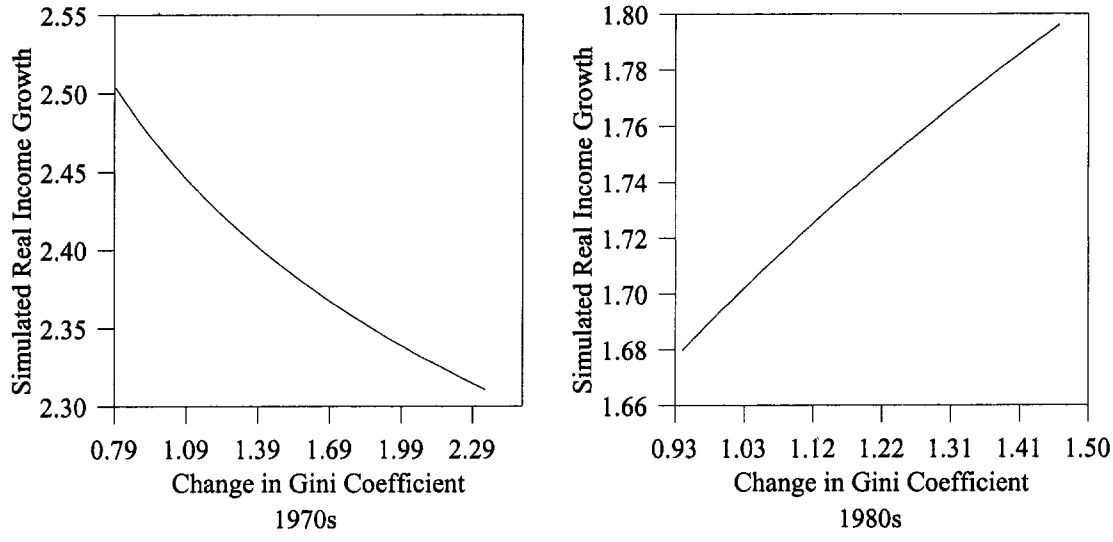

Figure 1. Simulated effect of change in inequality ($GINI_{t+10}/GINI_t$) on income growth (Y_{t+10}/Y_t), 1970s and 1980s

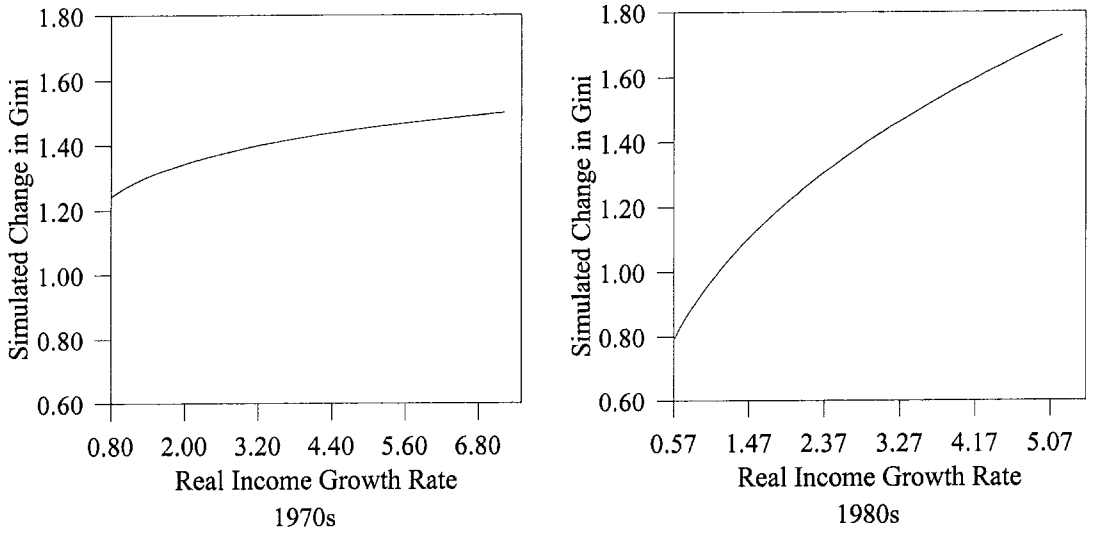

Figure 2. Simulated effect of change in income growth (Y_{t+10}/Y_t) on inequality ($GINI_{t+10}/GINI_t$), 1970s and 1980s

particularly strong effect in the 1980s. Thus, in both the income growth and inequality models, regional variables have become more important statistically over time.[4]

Effects of Macroeconomic Policies

Figures 1 and 2 summarize the main findings of this study on the simultaneous relationship between income growth and distribution, using simulations based on parameter estimates

[4] Fixed-effect models using pooled time-series/cross-sectional data also were estimated; the fixed-effects coefficient estimates essentially represented averages of the parameter estimates obtained for the two decades, and there was little difference overall in the estimated regression coefficients obtained using the pooled and nonpooled data sets.

of equations (1) and (2). In this section, we suggest that the reversal of the relationship in figure 1 is a result of the different macroeconomic policies which prevailed in the 1970s versus the 1980s.

In the 1970s, counties with greater increases in inequality experienced reduced income growth rates, and smaller increases in inequality were associated with faster income growth rates. During the late 1970s, rapid rates of inflation led to negative real interest rates, and debtors (often poor) benefitted at the expense of creditors (often wealthy). With inflation rising, individuals were pushed into ever higher income tax brackets. This "fiscal drag," while reducing income inequality, may have come at the cost of reduced economic growth. We suspect that the social and economic policies which led to increasing inflation during the 1970s contributed to the economic *malaise* that the Carter years now are generally known for (Duffy). At the same time, *real* income growth rates during the 1970s did not statistically significantly affect changes in income inequality during the 1970s (the slope of the 1970s line in figure 2 is less steep than that of the 1980s).

In the early 1980s, the Reagan Administration introduced two major tax policy changes. First, top marginal income tax rates were substantially reduced, and second, tax brackets were indexed to the consumer price index to eliminate tax bracket creep. These two policies, along with a tight money supply policy pursued by the Federal Reserve Bank after Paul Volker's appointment in 1979, may explain the structural change observed in figure 1. The reductions in marginal tax rates and the indexing of tax brackets in the Reagan tax reform package, and the reduction in inflation that occurred as a result of the Federal Reserve Bank's money supply restrictions, had a positive effect on economic growth rates but increased income inequality, according to our analysis.

With the lower marginal tax rates, high-income households keep a larger proportion of their incomes, and these households are also primary savers and investors. In turn, savings and investments foster economic growth and create jobs at all income levels. With lower inflation rates in the 1980s, individuals were less likely to purchase nonproductive assets such as real estate as an inflation hedge, and were increasingly likely to make financial investments that stimulate economic growth. In figure 2, the structural relationship also changed between decades of the 1970s and 1980s, since the more rapid real income growth in the 1980s was associated with more rapid increases in inequality. In the 1980s, counties with more rapid increases in inequality also experienced faster income growth rates. Thus, counties in which the distribution of the economic pie became more uneven also generated a larger overall pie, ceteris paribus. We believe this is because as the income distribution becomes less even, a greater share of income goes into growth-stimulating investments.

Extensions

Perhaps the most remarkable other structural difference between estimates for the decades of the 1970s and 1980s is the statistical significance of wages and education in the 1980s inequality and growth models, and the lack of significance of these variables in the 1970s. To further explore the relationships among these and other exogenous variables, various interaction terms were included in the equations. For the inequality model, revised estimates for the 1970s in this case are:

$$\Delta GINI = \underset{(2.02)}{-0.512^{**}WAGE} - \underset{(1.95)}{0.144^{*}HSC} + \underset{(1.80)}{1.190^{*}WAGE\times HSC},$$

where t-statistics are in parentheses. Thus, both variables are statistically significant at below the 10% level when an interaction term is included. The marginal effect evaluated at the mean educational attainment level is $\partial\Delta GINI/\partial WAGE < 0$, so that higher average wages were associated with less growth in inequality in the 1970s, which is opposite to the result obtained for the 1980s. When the interaction term is added to the 1980s inequality model,

neither the interaction term nor the education variable differs from zero at below the 10% level of statistical significance. Furthermore, at the average wage level, $\partial\Delta GINI/\partial HSC < 0$, so that greater educational attainment was associated with reduced inequality in the 1970s, as was true in the 1980s. The $WAGE \times HSC$ interaction term in the growth models was statistically different from zero at the 10% level in the 1980s, but not the 1970s. When this term is included in the 1980s growth model, however, the coefficient estimate for wages is no longer significantly different from zero.

The interaction between minorities and educational attainment was significant only in the 1970s growth model. Revised coefficient estimates in this case were:

$$\Delta Y = \underset{(2.98)}{0.0181^{***}MINOR} + \underset{(1.64)}{0.0094^{*}HSC} - \underset{(2.27)}{0.044^{**}MINOR \times HSC},$$

which yields marginal effects $\partial\Delta Y/\partial MINOR < 0$, and $\partial\Delta Y/\partial HSC > 0$, when evaluated at the respective means of the interacted variables. In the 1970s inequality model, including the interaction term $MINOR \times METRO$ failed to change the lack of significance of either variable, but yielded a significant negative coefficient estimate (-0.042^{*}) for the interaction variable.

An interaction term for female-headed households and minorities yielded statistical significance for each of the variables involved in the 1980s (but not the 1970s) inequality model:

$$\Delta GINI = \underset{(1.68)}{0.0205^{*}MINOR} + \underset{(7.17)}{0.221^{***}FEMHH} - \underset{(2.14)}{0.142^{**}MINOR \times FEMHH},$$

with $\partial\Delta GINI/\partial MINOR > 0$, and $\partial\Delta GINI/\partial FEMHH > 0$. These results reveal the importance of including interaction terms among the regressors.

Furthermore, in a number of cases, structural changes occurred between the 1970s and 1980s which either eliminated the interactions (e.g., between wages and education in the inequality model) or introduced an interaction effect where there was none before (e.g., between female-headed households and minorities in the inequality model). Identifying reasons for these structural changes other than those discussed in the previous section on macroeconomic policies, describing the marginal effects calculated over ranges of the interaction terms (as opposed to only the means), and examining other potential interactions (such as between the employment shares and wages or education) are beyond the scope of this study, but could be explored in future research.

Summary and Concluding Remarks

This study examines joint determinants of U.S. county-level income growth and income inequality using Gini coefficients. Results indicate that the South experienced a significant change in the income growth-inequality relationship over the last two decades. In the 1970s, increases in family income inequality significantly depressed income growth, while in the 1980s, increases in inequality were associated with more rapid growth. This pattern is consistent with recent studies reporting evidence of growing income inequality in mature economies such as the United States (e.g., Danziger and Gottschalk).

The other mixed results of the cross-sectional analysis are also noteworthy. The effects of earnings in transportation and public utilities, and mining on family income growth were negative for the 1980s, but positive for the 1970s. The effect of ethnic minority population on family income growth was negative in the 1980s, but positive in the 1970s.

Further divergence in family income inequality in the U.S. South can be expected in the foreseeable future. This study revealed several factors likely to influence this pattern. Chief among these are growing wage differentials between unskilled and skilled labor, a consequence of increasing returns to education. These trends are likely to continue, along

with rising average educational attainment in much of the South. Moreover, in the future, new technology and global competition (such as NAFTA and GATT) are likely to continue to depress wages of low-skilled workers by reducing the demand for such workers (Burtless). Income inequality patterns in the future also will be affected by trends in household structure. In this regard, it will be particularly important to determine whether and how the Welfare Reform Act of 1996 affects household structure in general, and the proportion of female-headed households in particular.

Based on the empirical evidence contained in this article, it appears that the combined impacts of federal fiscal and monetary policies of the past two decades significantly affected both income inequality and economic growth. Rapid economic growth often comes at a cost of increased income inequality. The important question is: Should the federal government pursue policies that increase economic growth at the expense of reduced income inequality, or should reduced income inequality be targeted as a goal at a cost of reduced economic growth? There is no simple answer to this question. However, our findings suggest that it may not be possible to simultaneously achieve rapid economic growth while also reducing income inequality.

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