THE BLACK DROPOUT RATE AND THE BLACK YOUTH UNEMPLOYMENT RATE: A GRANGER-CAUSAL ANALYSIS

Michael Magura and Edward Shapiro

The high unemployment rate of black high school graduates can create the perception that a diploma is of little value and encourage dropping-out of school. Black youth who do drop out are less employable and further push up the black youth unemployment rate. This raises a question: Is the high dropout rate of black youth due to their high unemployment rate or is their high unemployment rate due to their high dropout rate? A study of this question using the definition of Granger-causality finds that it is the high unemployment rate which causes the high dropout rate rather than the opposite.

While black youth make up a relatively small, though growing, fraction of the youth population, their role in the youth unemployment problem is greatly disproportionate to their numbers. And that disproportion grows larger over time. For the period 1972-84, the unemployment rate for white teenage males rose from 14.2 to 16.8% while that for black teenage males jumped from 31.7 to 42.7%. There is an unemployment *problem* for white youth, but the fact of an unemployment rate 2.5 times that for white youth identifies an unemployment *crisis* for black youth as indicated by the most recent major book on this issue, *The Black Youth Employment Crisis.*[1]

Whether one addresses youth unemployment in general or that of blacks in particular, there are two basic views of the causes of the high and growing rate. One view focuses on the demand side: the relative scarcity of new jobs due to slow economic growth; the severity of recessions like those of 1973-75 and 1981-82; changes in job mix which affect demand,

minimum wage laws, and other noncompetitive restrictions; the tempo-
rary nature of many available jobs; and employer discrimination. The
other view focuses on the supply side: insufficient education, inadequate
training, lack of skills, absence of work ethic, somewhat high reservation
wages, or preference for leisure over work at existing wages.

If one distinguishes black from white youth unemployment, one can
find, even in this abbreviated list, causes of the much higher unemploy-
ment rate for black youth. On the demand side, one factor is discrimina-
tion: few will deny that employer discrimination against black youth is
worse than that against white youth. Hill and Nixon argue that most of the
causes in any list can be traced, directly or indirectly, to discrimination.[2]
Another factor is the little recognized decline in the demand for low-
skilled agricultural labor. Cogan has produced evidence to show that this
was the major cause of falling black teenage employment for the 1950-70
period, especially in the South.[3] In 1950 the proportion of black male
teenagers who were employed was significantly greater than that of white
teenagers; by 1970, the ratio for blacks had fallen to two-thirds of that for
whites. Cogan attributes one-half of this decline in the black ratio to the
rapid advance of labor-saving technology.

On the supply side, an apparently self-evident factor in the explanation
of the much higher black youth unemployment rate is the fact that inade-
quate education is far more common among black youth. One measure of
this is the ratio of high school dropouts to the sum of high school gradu-
ates and dropouts ages 16-24 years. Data for the years 1960-84 show that
the average of this ratio for the 25 year period was 0.29 for whites and 0.45
for blacks. However, numbers like these may attribute much more impor-
tance to dropping out as a cause of the relatively higher unemployment
rate for black youth than it deserves.

This follows from the interdependence between causes on the supply
side and causes on the demand side. One cause on the demand side is a
scarcity of new jobs (due to various reasons), and this cause, if sufficiently
strong, may result in a high dropout rate among black youth. Thus, drop-
ping out may not be an independent supply side cause, but in large part an
effect of demand side factors. The high school diploma has traditionally
been recognized as a "passport to the job market," but the value of that
passport diminishes over time as more and more of those who obtain it
find that they cannot secure decent-paying jobs with it. The decision of
black youth to drop out or forego the "passport" may then be significantly
influenced by their inability to perceive education as a means of improv-
ing their future economic well-being. Study after study of the cause of the

black dropout problem find that this perception of the value of education held by black youth is an important factor.[4]

Twenty years ago when there were relatively more good-paying jobs available to workers without a high school education, a strong demand for labor may have had the opposite effect than is expected now. Whereas a reduction in the youth unemployment rate today may encourage potential dropouts to stay in high school to get the diploma which is so essential for almost any job, a reduction in the unemployment rate a few decades ago may have encouraged dropping-out. In a study of all youth for the years from World War II to the early sixties, Duncan found that the dropout rate increased when the unemployment rate fell and vice versa.[5] Jobs in good times could be found in those days without the "passport" and young people quit high school to take them. Some evidence to be submitted in this article for the period from the early sixties to the early eighties, at least for black youth, suggests the opposite: the relatively high unemployment rates faced by these youth accelerated their dropout rate.

In trying to explain youth unemployment, the relative emphasis placed on certain demand side and supply side causes has probably also changed. In the earlier post-World War II period, the supply side question of whether dropping-out caused high youth unemployment was infrequently asked because the high school diploma was not as critical in obtaining employment then as it came to be later. However, by this same reasoning, it is surely appropriate today to ask whether the cause of the relatively high unemployment rate among black youth is due to their high dropout rate and inadequate education. Combining this question with its opposite, one may pose the following question on causation: Is the high unemployment rate of black youth due to their high dropout rate and inadequate education or is their high dropout rate and inadequate education due to their high unemployment rate? To the degree that the latter is the case, the high unemployment rate must be the result of causes other than dropping-out and inadequate education.

The purpose of this article is to present the results of a study of this question revealed by using the notion of Granger-causality.[6] More specific results are provided below, but we may note here that the results suggest that it is the high unemployment rate of black youth which causes their high dropout rate rather than their high dropout rate which causes their high unemployment rate.

MEASURES OF EMPLOYMENT STATUS AND DATA SOURCES

Although studies referenced above were limited to the unemployment rate, we have carried out the Granger-causal tests based on both the un-

employment rate and the nonemployment rate. Columns 4 and 6 of Table 1 give the unemployment rate and nonemployment rate by race for high school graduates and dropouts combined and for the two groups separately for the latest available year, 1984. The tests described below are based on data for the years 1960-84.[7]

For the Granger-causal tests which examine the relationship between the black unemployment rate and the black dropout rate, the two variables were defined as follows:

The black unemployment rate is the number of each year's unemployed black high school graduates and unemployed dropouts divided by the number of each year's high school graduates and dropouts who entered the labor force. For example, as shown in Table 1, the numbers (in thousands) for 1984 were 110/252 = 43.7%.

The black dropout rate (labor force) is the number of each year's black dropouts who entered the labor force divided by the number of each year's black high school graduates and dropouts who entered the labor force. For 1984, 61/252 = 24.2%.

For the Granger-causal tests which examine the relationship between the black nonemployment rate and the black dropout rate, the two variables were defined as follows:

The black nonemployment rate is the number of each year's black high school graduates and dropouts not employed divided by the number of each year's high school graduates and dropouts in the civilian noninstitutional population. For 1984, 229/371 = 61.7%.

The black dropout rate (civilian noninstitutional population) is the number of each year's dropouts in the civilian noninstitutional population divided by the number of each year's high school graduates and dropouts in the civilian noninstitutional population. For 1984, 109/371 = 29.4%.

The corresponding rates for whites were defined in the same way. For 1984 the four rates for whites were 270/1,226 = 22.0%, 321/1,226 = 26.2%, 586/1,542 = 38.0%, and 483/1,542 = 31.3%, respectively.

The first of these rates, the unemployment rate, is, of course, more familiar than the nonemployment rate and is the one almost always quoted. The nonemployment rate includes in the numerator both those who are neither working nor looking for work and, therefore, are not counted as unemployed, and those who are looking for work and are counted as unemployed; it includes in the denominator both those who

TABLE 1
Unemployment and Nonemployment Status of 16-to-24 Year Old High School Graduates Not Enrolled in College and School Dropouts by Race, 1984 (in thousands)

	(1) Civilian Noninstitutional Population	(2) Civilian Labor Force	(3) Number Unemployed	(4) =(3)÷(2) Unemployment Rate	(5) =(1)−[(2)−(3)] Number Not Employed	(6) =(5)÷(1) Nonemployment Rate
High School Graduates and Dropouts	1,913	1,478	380	25.7	815	42.6
Black	371	252	110	43.7	229	61.7
White	1,542	1,226	270	22.0	586	38.0
High School Graduates	1,321	1,096	252	23.0	477	36.1
Black	262	191	74	38.7	145	55.3
White	1,059	905	178	19.7	332	31.4
Dropouts	592	382	128	33.5	338	57.1
Black	109	61	36	59.0	84	77.1
White	483	321	92	28.7	254	52.6

Source: Unpublished statistics provided by the Bureau of Labor Statistics, U.S. Department of Labor

are not in the labor force and those who are, the sum of the two being the civilian noninstitutional population.

Modifications of these rates have been suggested. For example, Wachter would not count full-time students as unemployed if they seek part-time work but do not find it on the grounds that their major activity is school and their attachment to the job market is marginal.[8] However, we cannot adopt this or other modifications in this study. The only available long-term data series on dropouts is that for 1960-84 noted above, and this can be combined only with the conventional unemployment and nonemployment data which accompany and are consistent with the dropout series. Hence, we are restricted to the two standard rates noted above.

Table 1 shows for 1984 the number (in thousands) of white and black 16 to 24 year olds who (1) dropped out of school during that school year and (2) graduated from high school during that school year but did not enter college. For both dropouts and high school graduates, the data show the number who did not enter the labor force and the number who did, and for the latter the number employed and the number unemployed. Not all of these variables are shown in Table 1, but they may be derived from those shown. The data in Table 1 do not show the *total* number of dropouts in the country for the age group, only the number who dropped out in that particular year, that is, 109,000 blacks in 1984. Similarly, the number for unemployed dropouts is specifically the number of that particular year's dropouts who were unemployed, that is, 36,000 blacks in 1984. The same interpretation applies to the numbers for high school graduates.

METHODOLOGY

The time series techniques and the definition of causality formally introduced by Granger and popularized by Sims and others have been widely employed in the macroeconomics literature.[9] For one pair of variables considered here, the unemployment rate for 16-24 year old blacks, UB, and the dropout rate for the same group, DB, Granger-causality from UB to DB is said to exist if past values of UB help to explain variations in DB after past values of DB have been taken into account.

Specifically, consider the bivariate vector autoregressive (VAR) model:

$$DB_t = \beta_{11}(L)DB_t + \beta_{12}(L)UB_t + \epsilon_{1t}$$
$$UB_t = \beta_{21}(L)DB_t + \beta_{22}(L)UB_t + \epsilon_{2t} \tag{1}$$

where $\beta_{ij}(L) = \sum\limits_{k=1}^{m} \beta_{ijk}L^k$ are distributed lag polynomials in the lag oper-

ator L, (L) $UB_t = UB_{t-1}$ and k is the order of the polynomial. The ϵ_{it} disturbances have zero means and covariance matrix Σ. DB is said to Granger-cause UB unidirectionally if $\beta_{12} = 0$ while $\beta_{21} \neq 0$. If $\beta_{21} = 0$ and $\beta_{12} \neq 0$, UB causes DB. If β_{12}, $\beta_{21} \neq 0$, there is feedback. Finally, if $\beta_{12} = \beta_{21} = 0$, DB and UB are independent. The intuition here is that, if the coefficients on the lagged values of UB in the DB equation are not significantly different from zero $(\beta_{12} = 0)$ while those of DB in the UB equation are significant $(\beta_{21} \neq 0)$, then UB does not cause DB while DB does cause UB because it helps to explain future values of UB.

The same interpretation of Granger-causality applies to the other pair of variables: the nonemployment rate for 16-24 year old blacks, NEB, and the dropout rate for the same group, DPB.

One issue in the specification of the VAR model in (1) is the choice of lag length. Some, for example, Sims, use common lag lengths for all variables included in the VAR. A problem with this approach, however, was acknowledged by Sims in a later article: for each additional lag, the number of parameters to be estimated increases by the square of the number of variables.[10] This can present degrees of freedom difficulties. To avoid this problem a number of alternatives have been suggested. The alternative used here is the sequential procedure suggested by Hsiao.[11] Based on Akaike's final prediction error (FPE) criterion, the procedure imposes zero restrictions on the VAR and allows for different lag lengths for each variable in the equation.[12] The FPE criterion admits additional lags of a variable in the specification of an equation only if, after imposing a penalty for more regressors, the sum of squared errors (SSE) for the equation, is reduced.

EMPIRICAL RESULTS

Because the time series techniques employed here require stationary data, all series were first filtered by taking the difference of the logs. The model described in (1) above was estimated by using the seemingly unrelated (SUR) technique. SUR, a type of generalized least-squares, takes cross-equation error correlations into account and, therefore, results in efficient coefficient estimates.[13]

Table 2 presents the estimated equations for black and white youth: two equations for each group based on labor force data and two for each group based on noninstitutional population data.[14] As Sims and others have

TABLE 2
Estimated Results

Labor Force Data

Black Youth:

$$DB_t = -0.34DB_{t-1} - 0.32UB_{t-1} \qquad\qquad R^2 = 0.29 \quad \chi^2 = 4.09*$$
$$\;(2.33)\quad\quad\;(2.32)$$

$$UB_t = 0.28UB_{t-1} - 0.12DB_{t-1} + 0.39DB_{t-2} \qquad R^2 = 0.17 \quad \chi^2 = 3.63$$
$$\;(1.31)\quad\quad(0.52)\quad\quad(1.66)$$

.

White Youth:

$$DW_t = -0.07DW_{t-1} \qquad\qquad\qquad\qquad R^2 = 0.01 \qquad ---^b$$
$$\;(0.40)$$

$$UW_t = -0.24UW_{t-1} - 0.72DW_{t-1} - 0.38DW_{t-2} \qquad R^2 = 0.20 \quad \chi^2 = 3.31$$
$$\;(1.12)\quad\quad\;(1.51)\quad\quad\;(0.82)$$

Non-institutional Population Data

Black Youth:

$$DPB_t = -0.40DPB_{t-1} \qquad\qquad\qquad\qquad R^2 = 0.13 \qquad ---^b$$
$$\;(2.27)$$

$$NEB_t = 0.24NEB_{t-1} - 0.51NEB_{t-2} - 0.01DPB_{t-1} + 0.31DPB_{t-2} \quad R^2 = 0.46 \quad \chi^2 = 4.28$$
$$\;(1.47)\quad\quad\;(3.33)\quad\quad\;(0.11)\quad\quad(2.27)$$

White Youth:

$$DPW_t = 0.08DPW_{t-1} - 0.25DPW_{t-2} + 0.20DPW_{t-3} \quad R^2 = 0.57 \qquad ---^b$$
$$\;(0.98)\quad\quad\;(4.23)\quad\quad(2.96)$$

$$NEW_t = -0.20NEW_{t-1} - 0.38DPW_{t-1} \qquad\qquad R^2 = 0.26 \quad \chi^2 = 4.00*$$
$$\;(1.14)\quad\quad\;(2.32)$$

^{a}t-ratios are presented in parentheses.
^{b}Since the second variable did not meet the FPE criterion, it was not included in the equation; χ^2 statistics, therefore, could not be calculated.
$*\chi^2$ value significant at the 5% level.

emphasized, the individual regression coefficients and t-ratios presented in Table 2 are not directly interpretable in the way customary with structural models.[15] Similarly, the sign of a particular parameter estimate is not interpretable as an indicator of the direction of change. To assess the dynamics of a system, one typically examines the impulse response functions.[16] In addition to the estimated equations, Table 2 presents the χ^2 values from the likelihood ratio tests of the null hypothesis that $\beta_{12} = 0$ or $\beta_{21} = 0$.[17]

Looking first at the equations for black youth based on the labor force data, we find that there is unidirectional causality from the unemployment rate to the dropout rate. Since the χ^2 value of 4.09 for the DB equation is significant at the 5% level whereas the value of 3.63 for the UB equation is not significant at even the 10% level, we can conclude that $\beta_{12} \neq 0$ and $\beta_{21} = 0$ or UB causes DB unidirectionally. This finding was supported by variance decomposition results.[18] These results indicate that, after five periods, 71% of the forecast variance of the dropout rate was explained by variations in its own past values and 29% was explained by variations in the unemployment rate. In contrast, 93% of the forecast variance of the unemployment rate was explained by its own past variations and only 7% by variations in the dropout rate. With the unemployment rate explaining a good deal of the variation in the dropout rate but the converse being not true, we conclude that the black unemployment rate Granger-causes the black dropout rate.

In comparison to the results just noted for blacks, the results for the equations for white youth based on the labor force data indicate that the white dropout and white youth unemployment rates are independent. Lagged values of the unemployment rate for whites did not pass the FPE criterion and therefore did not enter the DW equation. Although the dropout rate in the UW equation did pass the FPE criterion, the χ^2 statistic was not significant at even the 10% level. Therefore, no causal relationship between the unemployment rate and the dropout rate for white youth is indicated, whereas causality going from the unemployment rate to the dropout rate is indicated for black youth.

An explanation for this difference may lie in the discouragement and defeatism felt by black youth as they look at their job prospects. In contrast, white youth, on the average, are much less likely to quit school for this reason. However poor their job prospects may be on graduating from high school, these prospects are so much better than those of blacks that white youth view dropping-out as much less of a barrier to getting a job than do blacks. This suggests that dropping-out by whites is not so strongly affected by unemployment conditions but is due more to other factors.

Turning to the results in Table 2 based on the data for the noninstitutional population, we find that the nonemployment rate for black youth does not Granger-cause the dropout rate for this group. The FPE criterion was not passed by NEB in the DPB equation; therefore, lagged values do not appear in that equation. It should be noted, however, that the FPE criterion was almost passed. For the opposite question—Does the dropout rate cause the nonemployment rate?—we find that DPB does enter the

NEB equation, but the χ^2 value of 4.28, with 2 degrees of freedom, is only significant at the 11% level.

A possible explanation for the differences between the findings for the nonemployment and the unemployment rates is the fact that the non-employment rate is based on a much larger number of people than just those in the labor force. The calculation of this rate takes into account those not employed and not looking for work as well as those looking for work. For example, the number of those still in school and not looking for work affect the nonemployment rate but not the unemployment rate. In evaluating job prospects, young people are surely guided more by the unemployment rate than by the nonemployment rate, a measure unfamiliar to the general population and not very indicative of labor market conditions. To the degree that labor market conditions affect the decision to stay in or drop out of school, one may plausibly argue that the unemployment rate is likely to exert much more influence than the nonemployment rate. From this one may expect the results we find for blacks: the unemployment rate Granger-causes the dropout rate (labor force basis) but the nonemployment rate does not Granger-cause the dropout rate (noninstitutional population basis).

Last, to compare black and white nonemployment rate results, we find that the nonemployment rate for whites, as for blacks, does not Granger-cause the dropout rate. As with the black youth results, the nonemployment rate for whites, NEW, did not pass the FPE criterion. For the opposite question—Does the dropout rate for white youth Granger-cause their nonemployment rate?—the answer is positive and more clearly positive than for black youth. This result may follow for both groups simply from the fact that job prospects are adversely affected by lack of a diploma and fewer dropouts for this reason may enter the labor force. However, while these people are not unemployed, they are nonemployed and their number raises the nonemployment rate or provides the basis for Granger-causation from dropouts to nonemployment. As noted above, this was true for blacks only at the 11% level of significance and for whites at the 5% level.

With respect to all of the empirical results in Table 2, it must be noted in closing that the data on which they are based are limited to annual observations for only a twenty-five year period and must therefore be accepted with caution.

CONCLUSION

None of the many studies of black youth unemployment and non-employment and of black dropouts has turned to the available data to find

what causal relationship, if any, exists between these two variables. In investigating this question, we have found that it is the relatively high unemployment rate of black youth that causes, in a Granger sense, their relatively high dropout rate. The policy implication of this finding is clear: the attack on the extremely high and growing black youth unemployment rate should emphasize the demand side by improving job opportunities for these young people; to the degree that progress is made in this direction, progress on the supply side in the form of a reduced dropout rate will follow.

The alternative attack which emphasizes the supply side, in particular, attempting to achieve a lower dropout rate in order to qualify more black youth for jobs, will not succeed as long as they see little likelihood of getting a satisfactory job even with the high school diploma in hand. With causation running from unemployment to dropping out, providing more jobs takes priority over reducing the number of dropouts, although it is obviously desirable to do as much as can be done in both directions.

NOTES

1. Richard B. Freeman and Harry J. Hozer (eds.), *The Black Youth Employment Crisis* (Chicago: University of Chicago, 1986).
2. Robert B. Hill and Regina Nixon, *Youth Employment in American Industry* (New Brunswick, New Jersey: Transaction Books, 1984), pp. 39-40.
3. John F. Cogan, "The Decline in Black Teenage Employment: 1950-70," *American Economic Review* 72 (September 1982), pp. 621-638.
4. See, for example, Lawrence G. Felice, "Black Student Dropout Behavior: Disengagement From School, Rejection and Racial Discrimination," *The Journal of Negro Education* 50 (Fall 1981), pp. 415-424.; Michael Fine and Pearl Rosenberg, "Dropping Out of High School: The Ideology of School and Work," *Journal of Education* 165 (Summer 1983), pp. 257-272; Ronald L. Richardson and S. Craig Gerlach, "Black Dropouts: A Study of Significant Factors Contributing to a Black Student's Decision," *Urban Education* 14 (January 1980), pp. 489-494.
5. Beverly Duncan, "Dropouts and the Unemployed," *Journal of Political Economy* 72 (April 1965), pp. 121-134.
6. C.W.J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica* 37 (July 1969), pp. 424-438.
7. The full set of figures for 1960-84 is available on request from the authors and is on file with the editor of the journal. The sources of these data are as follows: 1960-80, *Labor Force Statistics Derived from the Current Population Survey: A Databook* Volume 1, Bulletin 2096, September 1982, Table 3, pp. 767-774; 1981-83, *Handbook of Labor Statistics,* Bulletin 2217, June 1985, Table 60, p. 163, both publications of the U.S. Department of Labor, Bureau of Labor Statistics; 1984, unpublished statistics provided by the Bureau of Labor Statistics. The data for 1960 to 1976 include blacks and other non-whites and for 1977 to 1984 blacks only. For simplicity we refer to blacks for the full period, 1960-84.
8. Michael L. Wachter, "The Dimensions and Complexities of the Youth Unem-

ployment Problem," in *Youth Employment and Public Policy* edited by Bernard E. Anderson and Isabel V. Sawhill (New York: Prentice-Hall, 1980), pp. 33-63.

9. Granger, *op. cit.,* and Christopher Sims, "Money, Income and Causality," *American Economic Review* 62 (September 1972), pp. 540-552.

10. Christopher Sims, "Macroeconomics and Reality," *Econometrica* 48 (January 1980), pp. 1-48.

11. Cheng Hsiao, "Autoregressive Modeling of Canadian Money and Income Data," *Journal of the American Statistical Association* 74 (September 1979), pp. 533-60 and Cheng Hsiao, "Autoregressive Modelling and Money-Income Causality Detection," *Journal of Monetary Economics* 8 (January 1981), pp. 85-106.

12. The FPE procedure has been widely used in the literature. See Hizotogu Akaike, "Statistical Prediction Identification," *Annals of the Institute of Statistical Mathematics* 21 (1969), pp. 203-217; Hizotogu Akaike "Fitting Autoregressions for Prediction," *Annals of the Institute of Statistical Mathematics* 21 (1969), pp. 243-247; James S. Fackler, "An Empirical Analysis of the Markets for Goods, Money, and Credit," *Journal of Money, Credit, and Banking* 17 (February 1985), pp. 28-42; James Lesage and Michael Magura, "Econometric Modeling of Interregional Labor Market Linkages," *Journal of Regional Science,* vol. 26, no. 3 (1986), pp. 567-577.

13. See, for example, Robert S. Pindyck and Daniel Rubinfeld, *Econometric Models and Economic Forecasts* (New York: McGraw-Hill, 1981), pp. 331-34.

14. Model adequacy was checked by lagging the residuals of each equation on six own-lags and performing joint F-tests. Also Durbin's cumulated periodogram was used. (See J. Durbin, "Tests for Serial Correlation in Regression Analysis Based on the Periodogram of Least Squares Residuals," *Biometrika* 56 (1970), pp. 1-16) Neither test permitted the rejection of the hypothesis that the residuals were not significantly different from white noise.

15. Sims, 1980.

16. Impulse response functions were generated and are available from the authors.

17. See, for example, Sims, 1980.

18. Ibid.