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15 August 1975

Online at <https://mpra.ub.uni-muenchen.de/51188/>
MPRA Paper No. 51188, posted 05 Nov 2013 18:50 UTC

MIGRATION, ECONOMIC OPPORTUNITY, AND THE QUALITY OF LIFE: REPLY AND EXTENSION

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We are grateful to Professor Graves for pointing out an important empirical error in our recent paper on migration and the quality of life [1]. Graves is correct in observing that by inadvertently recording the variable G_i as the growth rate of aggregate income rather than *per capita* income we have generated imprecise results.

Graves' own substitute equations are both relevant and interesting. Given the presence of the growth rate of per capita personal income in both our model and his models as well, however, we feel it may be important to allow for any possible simultaneity between migration rates and the growth rates of per capita income. Accordingly, in this Reply, we estimate a simple two-equation model by two-stage least-squares. The model allows us to focus on the migration impact of the quality of life by including the climate variable found to be so important both in our initial paper and in Graves' study. Moreover, it also permits us to allow for any interactive effects between SMSA migration and the growth in per capita income in SMSA's. Use of this simultaneous-equations technique will presumably then generate more dependable results and greater insight into the quality-of-life issue at hand.

1. THE MODEL

The basic model, with expected partial derivative signs in parenthesis below the respective arguments, is given in Equations (1) and (2) below

$$(1) \quad M_i = M(G_i, T_i, X_i)$$

(+) (-) (-)

and

$$(2) \quad G_i = G(M_i, T_i, U_i)$$

(+) (-) (-)

Where: M_j = net in-migration rate to SMSA i , 1960-1970,

G_i = annual average percentage rate of growth in per capita personal income in SMSA i , 1959-1968,

T_i = average number of days per year when the i th SMSA's temperature reached 32° Fahrenheit or below,

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U_i – average (of 1963, 1965, 1966, 1967, 1968) annual rate of unemployment in SMSA i and

X_i = per capita property taxes in SMSA i , 1967.

This model includes the apparently important quality of life variable, climate, as well as purely economic variables.¹

The data on migration were obtained from the *1970 Census of Population and Housing* [4, Table 3]. The climate data were obtained from the *Statistical Abstract of the United States, 1973* [5, Table 294]. The data on per capita income growth and taxes were obtained from the *Statistical Abstract of the United States, 1971* [5, Section 33]. Finally, various issues of the *Statistical Abstract* [5, Section 33] were used to compute the unemployment figures.

The signs in Equation (1) are from conventional theory or discussed in Cebula and Vedder [1]. Only the sign of aG_i/aT_i may require explanation. Perloff and Wingo [3] have argued that the United States is in the age of the "amenity resource." Many industries (foot-loose industries) are purportedly climate-oriented (Perloff and Wingo [3, p. 223J), and hence areas with warmer or more moderate climates may grow more rapidly because they can better attract such industries. Since in effect T_i refers to cold weather, we would then expect colder SMSA's to grow less rapidly, *ceteris paribus*.

The precise system to be estimated is

$$(3) \quad a_0 + a_1G_i + a_2T_i + a_3X_i + a_4$$

$$(4) \quad b_0 + b_1M_i + b_2T_i + b_5U_i + b_4$$

where a_0 and b_0 are constants and a_4 and b_4 are stochastic error terms.

2. THE RESULTS

The results from estimating system (3) and (4) by two-stage least-squares is given by

$$(5) \quad M_i = -27.02313 + 4.71689 G_i + 0.77897 T_i + 0.18681 X_i \quad DF = 44$$

(2.55) (2.09) (0.95)

and

$$(6) \quad G_i = +10.37440 + 0.25646 M_i - 0.17482 T_i + 0.54626 U_i, \quad DF = 44$$

(1.98) (0.91) (1.70)

where the terms in parentheses are t values.

This two-equation model estimated in this study reveals that there are interactive effects between M_i and G_i . In particular, both M_i and G_i are positively and significantly affected by one another. Having allowed for such effects, our model now reveals that climate exercised an important impact over migration to SMSA's for the period 1960-1970. This is compatible with our original results and Graves' various results. Thus, we once again observe support for the notion that migrants are responsive to the quality of life.

¹Following Pack [2], M_i refers to white migrants, and it is expected that $aM_i/aX_i < 0$.

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