Determinants of Geographic Living-Cost Differentials in the United States: An Empirical Note

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I. INTRODUCTION

In the United States, there exist enormous geographic differentials in the level of the cost of living. The existence of these large living-cost differentials has recently been shown to markedly influence geographic mobility patterns within the United States (see Cebula 1979, 1980; Renas and Kumar 1978, 1979; and Werthwein 1980). This may be very important because, as West, Hamilton, and Loomis (1976) and Cebula (1979) argue, given the stability of both birth and death rates, internal migration is likely to be the principal determinant of regional and interregional labor market adjustments in the United States.

Given the apparent importance of geographic living-cost differentials in determining the spatial allocation of human resources in the United States, this paper seeks to investigate empirically the determinants of these differentials. Hopefully, a better knowledge of these determinants will provide us with improved insights into the factors that strongly influence both geographic real income differentials and the functioning of regional and interregional labor markets in the United States. The analysis focuses upon those 37 Standard Metropolitan Statistical Areas (SMSAs) in the United States for which geographically comparable living-cost data and other needed data are available.[1] The year 1975 was the most recent year for which a completely satisfactory set of relevant data was available.

II. THE EMPIRICAL MODEL

In order to examine empirically the principal determinants of geographic living-cost differentials in the United States, the following model is postulated:

$$Ci = Ci(Di, Pi, Yi, Ti, Wi) \qquad [1]$$

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[1] The SMSAs studied were: Atlanta, Ga.; Austin, Tex.; Bakersfield, Calif.; Baltimore, Md.; Baton Rouge, La.; Boston, Mass.; Buffalo, N.Y.; Champaign-Urbana, Ill.; Cedar Rapids, Iowa; Chicago, Ill.-Northwestern Ind.; Cincinnati, Ohio-Ind.-Ky; Cleveland, Ohio; Dallas, Tex.; Dayton, Ohio; Denver, Colo.; Detroit, Mich.; Greenbay, Wis.; Hartford, Conn.; Houston, Tex.; Indianapolis, Ind.; Kansas City, Mo.-Kans.; Lancaster, Pa.; Los Angeles-Long Beach, Calif.; Milwaukee, Wis.; Minneapolis-St. Paul, Minn.; Nashville, Tenn.; New York, N.Y.-Northeastern N.J.; Orlando, Fla.; Philadelphia, Pa.-N.J.; Pittsburgh, Pa.; Portland, Maine; St. Louis, Mo.; San Diego, Calif.; San Francisco-Oakland, Calif.; Seattle-Everett, Wash.; Washington D.C.-Md.-Va.; Wichita, Kans. These 37 areas comprise the complete set of SMSAs for which geographically comparable living-cost data are available for the year 1975. Although such living-cost data were also available for Durham, N.C. and Honolulu, Hawaii, these two areas were omitted from the study due to a lack of other needed data. The living-cost data were obtained from *The Statistical Abstract of the United States, 1976,* Table 715. Sources of the other data used in this paper are provided in n. 3.

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where,

Ci = the average cost of living for a four-person family living on an intermediate budget, in SMSAi, 1975, expressed in current dollars

Di = the population density in SMSAi, 1975, in terms of the number of persons per square mile

Pi = the 1975 total population in SMSAi

Yi = the 1974 per capita income in SMSAi

Ti = the 1972 per capita level of property taxes paid by businesses in SMSAi[2]

Wi = a dummy variable which indicates the existence of right-to-work legislation in the state where SMSAi is principally located (the variable assumes a value of "1" if there is right-to-work legislation and a value of "0" otherwise)[3]

It is hypothesized here that the greater the population density in SMSAi, the greater the amount of congestion within the SMSA. With greater congestion, it is argued that transit costs, marketing costs, and other cost factors which influence the overall cost of living in an area will increase. Hence, ceteris paribus, it is expected that:

$$\frac{\partial Ci}{\partial Di} > 0 \qquad [2]$$

Next, it is hypothesized that within a given SMSA there are agglomeration (urbanization) economies associated with a larger population size. As Isard (1956, p. 182) contends, areas subject to agglomeration (urbanization) economies have "access to a larger pool of skilled labor . . . and fuller use of specialized and auxiliary industrial and repair facilities." Thus, ceteris paribus, we would expect areas with larger populations to be characterized by lower production costs and hence by a lower cost-of-living:

$$\frac{\partial Ci}{\partial Pi} < 0 \qquad [3]$$

Next, the greater the per capita income in an area, the greater is the average level of demand for goods and services in that area. In turn, a greater demand for goods and services implies, ceteris paribus, a higher average commodity-price structure:

$$\frac{\partial Ci}{\partial Yi} > 0 \qquad [4]$$

The property tax for firms tends to be a tax on capital; as such, higher property tax levels could, over time, bias production processes toward greater degrees of labor intensity. As a pragmatic matter, such labor-biased production processes are likely to be less subject to scale economies than the more capital-intensive processes that would have been adopted under lower property tax levels. Thus, over time, the higher the effective property tax rate, the higher the final prices of goods and services are likely to be.

In addition, the property tax may come to bear upon output prices in another way. In particular, to the extent that the burden of the property tax is directly shifted from producers to households in the short run, higher production (output) costs resulting from higher property taxation are likely to be reflected (in part)

[2] Figures for local government expenditures and tax levels are compiled only on a five-year basis. Thus, 1972 is the most recent year available for this analysis.

[3] The data sources for the variables are as follows: Wi is from U.S. Bureau of the Census, *Statistical Abstract of the United States, 1976*, Table 619; Di, Pi, Yi, and Ti are from U.S. Bureau of the Census, City and County Data Book, 1977, Table 4.

in higher final product prices in the marketplace. For these reasons, it is hypothesized here that:[4]

$$\frac{\partial Ci}{\partial Ti} > 0 \qquad [5]$$

Finally, the existence of right-to-work laws prohibiting the "union shop" implies a labor-market environment with less union power and thus less labor-market pressure (on the supply side) to elevate labor costs. To the extent that right-to-work legislation leads to lower labor costs and hence to lower production costs, there is likely to be a tendency for final product prices to be lower, ceteris paribus:

$$\frac{\partial Ci}{\partial Wi} < 0 \qquad [6]$$

The actual regression to be estimated is given by:

$$Ci = a_0 + a_1Di + a_2Pi + a_3Yi + a_4Ti + a_5Wi + \mu \qquad [7]$$

where,
a_0 = constant
Ci, Di, Pi, Yi, Ti, Wi = as above
μ = stochastic error term

Before proceeding to the actual empirical results, a number of comments regarding the data are appropriate. To begin with, the living-cost data examined in this study are geographically comparable in view of the high degree of comparability of the market baskets of consumer goods among areas. Nevertheless, it is not clear that the living-cost data control adequately for quality differences in the market baskets of consumer goods. Thus, although geographically comparable in a general, overall sense, the living-cost data are not perfectly comparable. Hence, these data may be slightly crude and imprecise.

TABLE 1
CORRELATION MATRIX

	Di	*Pi*	*Yi*	*Ti*	*Wi*
Di	+1.00				
Pi	+ .83	+1.00			
Yi	+ .33	+ .49	+1.00		
Ti	+ .40	+ .41	+ .39	+1.00	
Wi	− .19	− .13	+ .13	− .26	+1.00

It has been observed herein that living costs are a decreasing function of population *size*, ceteris paribus, and that living costs are an increasing function of population *density*, ceteris paribus. As a pragmatic matter, however, an increase in population size is likely to increase population density. That is indicated by the zero-order correlation coefficient (in Table 1) of +.83. Thus, although our a priori arguments are based on an assumption of ceteris paribus, as a practical matter, the variables *Pi* and *Di* are highly interrelated. In addition, other interrelationships among the independent variables must be recognized. For example, the tax-level and the population-size variables are likely to be at least somewhat interrelated.

These observations regarding the quality of the living-cost data and the interrelationships among various of the independent variables in the analysis imply that the empirical results provided in the following section are not likely to be entirely conclusive. Further refinements in the data and other changes as well may be highly desirable.

[4] It must be stressed that *all* other taxes are impounded in the assumptions of equation [5]. In addition, large geographical property tax differentials exist even after allowing for the effects of the Internal Revenue Code (Aaron 1970).

III. EMPIRICAL RESULTS

The ordinary least squares (OLS) estimate of equation [7] is given by:

$$
\begin{aligned}
Ci &= 9997.8345 + \underset{(+3.06)}{0.51754^{**}Di} \\
&\quad - \underset{(-1.96)}{0.00019^{*}\,Pi} + \underset{(+3.43)}{0.92242^{**}Yi} \\
&\quad + \underset{(+2.23)}{3.51588^{*}Ti} - \underset{(-3.46)}{937.72639^{**}Wi}
\end{aligned}
$$

$$DF = 31, R^2 = .69, F = 13.54^{**}$$

where terms in parentheses are t-values, a single asterisk (*) denotes statistical significance at the .05 level, and a double asterisk (**) denotes statistical significance at the .01 level or better.

Overall, these results are very strong. For one thing, all five coefficients have the expected signs. In addition, two coefficients are statistically significant at beyond the .05 level, and three are significant at beyond the .01 level. Also, the F-ratio is significant at beyond the .01 level. Finally, the coefficient of determination (R^2) is .69, so that the model explains roughly seven-tenths of the variation in the dependent variable.

As for specific results, we turn first to population density (*Di*). The coefficient on *Di* is significant at beyond the .01 level with the expected positive sign. Thus, it appears that greater population density leads to higher living costs. As suggested above, the greater congestion that accompanies higher population density may lead to increased transit costs, marketing costs, and other costs and thusly to higher product (output) prices. The coefficient on the population-size variable (*Pi*) is significant at beyond the .05 level with the hypothesized negative sign. This suggests the existence of agglomeration (urbanization) economies as outlined by Isard (1956). The coefficient on per capital income (*Yi*) is positive and significant at beyond the .01 level, suggesting that the greater an area's per capita income, the greater the output demand and thus the higher the level of output prices. The coefficient on the tax variable (*Ti*) is positive and significant at beyond the .05 level, suggesting that higher property taxes may contribute to higher production costs and thus to higher output prices. Finally, the coefficient on the right-to-work variable (*Wi*) is negative and significant at beyond the .01 level. This suggests that the diminished upward pressure on labor costs (on the supply side) that results from right-to-work legislation helps to keep final output prices lower.

Naturally, the interpretations provided above are not absolutely conclusive. The data limitations are such that the conclusions derived from the estimation in equation [8] should be viewed as tentative. Perhaps improved data—especially improved living-cost data—can permit future analyses to yield more dependable conclusions.

IV. SUMMARY

This brief exploratory note has empirically examined the determinants of geographic living-cost differentials in the United States. Within the context of various data imperfections, it finds that greater population density, higher per capita incomes, and higher per capita property tax levels all act to raise the cost of living in SMSAs. On the other hand, greater population size and the existence of right-to-work legislation both act to lower the cost of living in SMSAs.

In closing, it is observed that, as the correlation matrix in Table 1 below illustrates, multicollinearity is not generally a problem in this analysis.

References

Aaron, H. 1970. "Income Taxes and Housing." *American Economic Review* 60 (Sept.): 789–806.

Cebula, R. J. 1979. *The Determinants of Human Migration*. Lexington, Mass.: D.C. Heath and Co.

———. 1980. "Geographic Mobility and the Cost of Living." *Urban Studies* 38 (Oct.): pp. 353–55.

Isard, W. 1956. *Location and Space Economy*. Cambridge, Mass.: The MIT Press.

Renas, S. and Kumar, R. 1978. "The Cost of Living, Labor Market Opportunities, and the Decision to Migrate: A Case of Misspecification?" *Annals of Regional Science* 12 (July): 95–104.

———. 1979. "Reply." *Annals of Regional Science* 13 (Nov.): 119–21.

Werthwein, J. 1980. "A Note on Migration Determinants." *Review of Business and Economic Research* 16 (Winter): 106–8

West, D. A.; Hamilton, J. R.; and Loomis, R. A. 1976. "A Conceptual Framework for Guiding Policy-Related Research on Migration." *Land Economics* 52 (Feb.): 66–76.