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GEOGRAPHICAL COST OF LIVING DIFFERENCES: INTERSTATE AND INTRASTATE, UPDATE 1991

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Abstract

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This paper develops a method for estimating current geographical differences in the cost of living index for all states for 1981-1990. These estimates based on BLS data are shown to correspond closely to statewide cost of living estimates for 1989 based on the American Chamber of Commerce Research Association data for selected cities.

The paper also develops estimates of the cost of living as among large cities, metropolitan areas, and nonmetropolitan areas within each state for 1989, and for all countries within Illinois for 1989.

Living costs are highest in Hawaii, Alaska, Connecticut, Washington D.C., New Jersey, Massachusetts, New York, and California. They are lower in Mississippi, West Virginia, Arkansas, Idaho, and Utah. There is a 57 percent difference in the purchasing power between the highest and lowest states, whereas the variation in real purchasing power within states between the higher cost large cities and lower cost metropolitan and nonmetropolitan areas is 22 to 35 percent respectively.

The basic pattern of differences persists since 1977 with shifts related to economic growth rates.

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Geographical Cost of Living Differences: Interstate and Intrastate; Update 1991

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Significant differences in the cost of living exist among different parts of the country, as well as among different rural and urban counties within the same state. But no systematic estimates of differences in the cost of living among states have been computed since 1980. The Bureau of Labor Statistics discontinued collecting and publishing its cost of living index for 24 SMSA's in 1981, and the American Chamber of Commerce estimates are also for selected cities and only for the most recent years.

A systematic procedure for estimating these differences among states and localities based on the Bureau of Labor Statistics data for the 24 SMSA's was developed earlier by McMahon and Melton (1978). The resulting estimates for 1977 found many uses. The basic method was adopted and extended by Fournier and Rasmussen (1986) who produced estimates by states for 1980. But since then there have been large differential impacts among states following the oil price increases of 1979-80, the recession and oil price declines in 1981-83, the effects of high interest rates on exchange rates and agricultural exporting states, and the industrial recovery in the late 1980s. All of these could be expected to lead to differential effects on prices and costs among geographical areas and therefore a changed pattern of geographical cost of living differences.

The ideal way to evaluate these differences would be to collect price data from PMSAs, MSAs, and Nonmetropolitan areas in every state, weighting these by the population in each area, and to also conduct detailed budget studies of family expenditures in each of these localities to establish the necessary geographical variation in the weights to be placed on each budget component. This procedure would be prohibitively expensive, however, and therefore likely will never be done in this detail. The Bureau of Labor Statistics in fact has moved in the opposite direction by discontinuing the collection and publication of its cost of living index in 1981. The American Chamber of Commerce Research Association ACCRA (1990) has recently started collecting data and computing an index for selected cities. But the budget weights do not vary by geographical area, and the index is not computed on a statewide or on a countrywide basis.

What is needed is a reduced form (predictive) equation that can be used to estimate the COL by states, or by counties within each state based on successive readings on the key explanatory variables in each place at each date, checking to see that the structure does not change. This paper does this, refining the procedure used in McMahon-Melton (1978) and in Fournier and Rasmussen (1986) to adapt it to both the kind of data that are available and to new housing value data that are now available on an annual basis. The results then are cross checked with statewide estimates based on the ACCRA (1990) sample. The result is an index of the cost-of-living estimated for each state from 1981 through 1990 based on the predictor variables for each state both on a base year (U.S. average for 1981 = 100) and on a normalized annual (U.S. average for each year = 100) basis. The paper concludes with a brief consideration of the nature of changes in the geographical differences in the cost of living between the earlier studies for 1977 and 1980 and the present, as well as of the trends during the 1980's.

I. Existing Cost of Living Measures and Their Uses

Both the US BLS (1982) index for 1981 and the ACCRA (1990) index for 1989 are for selected cities, and the geographical boundaries of the relevant PMSAs and MSAs change over time. The Consumer Price Index (CPI) is published by the BLS for 15 major urban areas, as well as for urban and rural breakdowns within the four geographical regions for the U.S., but it has a base of 100 in the base period (1982-84 = 100) and therefore does not show the initial differences in the level of living costs. The CPI instead is an index of price changes since that time, whereas in fact the cost of living in the base year in these places varied considerably. The CPI also is not available by state.

The method adopted therefore seeks to take these base-year differences in the cost of living into account by starting with the last report for a family cost of living budget for 1981 as reported by the BLS (in 1982). Attention is confined to those explanatory variables that have a logical relationship to the cost of living within each of the MSAs, since as much stability as possible in their predictive capacity is sought, and also to variables for which data is available on an annual statewide basis for 1981-1990. For these reasons there are some differences in the explanatory variables from those used by Fournier and Rasmussen (1986, p. 184) who do not seek relationships to the structural parameters, or stability over time, because they are concerned only with the single 1980 census year. However, the explanatory variables used here do reflect the major factors used in the Fournier and Rasmussen (1986) analysis as well as in the original McMahon-Melton (1978) estimates for 1977. After exploring the relationships within these MSAs, the cost of living index is then generalized to a statewide basis as explained below, and the stability of the relationship to these same explanatory variables is explored. This procedure is better than using the MSAs in each year because as mentioned above the geographical boundaries of the MSAs change over time, causing problems for explanatory variables such as population change and per capita income, whereas the statewide measures of these variables can be expected to be considerably more accurate over time.

The rationale for uses of specific cost of living indexes is straightforward. Geographical differences in the cost of living affect the purchasing power of wages and salaries, which are always paid in nominal dollars, at different locations. For salaries to be comparable in real terms they therefore must be deflated (i.e., divided by) a geographical cost of living index such as the one developed here. To avoid questions of interpersonal comparisons of utility, the BLS concept of a standard budget for a family of four, which we use here, is one that seeks to keep the head of the household on the same indifference curve with respect to commodities purchased irrespective of where he or she locates.

This concept, however, includes the living costs but does not include the non-monetary benefits of different locations (e.g., the sunshine, seaside, or access to alternative and better job opportunities), benefits that partly justify the higher costs and that also affect location decisions. That is, it may cost individuals more to maintain the same living standard in certain locations, but those locations may offer various additional advantages that they are willing to pay for. A geographical cost of living index is limited to differences in the monetary costs of living such as differences for comparable housing accommodations in different places, which can be substantial.

The uses that have developed for geographical cost of living indices, as well as an interpretation of its potential misuses, depend upon this concept. It is useful to employees in making decisions to locate because, to the extent that the cost side is to be considered in making these decisions, it is what the salary will buy in <u>real</u> terms, not in nominal terms, plus their evaluation of the non-monetary returns that basically govern the outcomes. That is, in analyzing the choice, the evidence is that a "money illusion" is not strong, after allowing for lags in adjustment, in which case employees would tend to make a correction for price level and cost of living differences first, and then evaluate the non-monetary benefits, albeit implicitly. Because of this behavior, multiplant firms with plants in different locations, state school systems with urban and rural unit districts, universities competing in interstate job markets, and other kinds of employers who wish to maintain salaries that are comparable in different locations (plus or minus the non-monetary environmental fringes) must also normally make some adjustment either explicitly or implicitly both for differences in costs of living as well as for the non-monetary advantages of the higher cost locations rather than looking only at the more purely nominal wage and salary differences. Some adjustments for non-monetary returns to particular locations or regions have been considered by Roback (1988) and by Blomquist et al. (1988).

A cost of living index has also been used to adjust production costs or investment costs to real terms when making geographical cost comparisons. This would include econometric estimates of cost functions using cross-section data, interstate comparisons of adequacy in education (e.g., A. Hickrod et al., 1987, p. 9), and comparisons of rates of return to education such as in the study by Israeli (1983) where the author extends the cost living index for the sampled population of 39 MSAs for an earlier year to the non-sampled population of 237 MSAs. A cost-of-living index is not precisely the same as the cost of production, investment costs, or an index of educational costs, but the procedure should give a reasonable approximation in those cases where wage and salary costs are a very large percentage of total costs, as is true in the case of schools and colleges for example. Geographical differences in the smaller non-labor costs in these cases may also be correlated with geographical differences in living costs, but this is a point that could be examined in special cases.

II. The Theory and The Model

There have been several earlier attempts to investigate the sources of differences in the cost of living in addition to the recent ones mentioned above. Sherwood (1975), for example, used the BLS indices and price data to construct standard budgets that isolate the effect of climatic differences on costs. But his indices are limited to this one source of differences and also were constructed for only the 44 cities and regions in his BLS sample. Haworth, Rasmussen, and Mattila (1973) and Alonso and Fajans (1970) explored the extent to which urban population and other variables explain differences in the cost of living within the BLS sample, but they did not undertake predictions for nonsampled areas. Alonso (1970) finds urban population size, when income is included, to be of minor significance. Israeli (1977) found that housing differences were a good predictor of the differential in nominal wages and prices among selected cities. But the only major efforts to extend cost of living indices from sampled to nonsampled areas have been by Simmons (1973, 1988) and by McMahon and Melton (1978). Simmons sampled prices in 12 Florida counties and then used regression equations to extend these prices to all counties in the state. The first result, in the absence of budget studies to obtain the necessary weights, is therefore closer to a geographic price index than to a cost of living index. Augmented by budget studies, it has been used by the State of Florida since 1974 in the Florida school aid formula. McMahon and Melton (1978) developed a model that explains cost of living differences within the BLS sample, and then used the regression coefficients, together with measures of the explanatory variables for the non-sampled areas, to extend the cost of living index to all 50 states and to estimate the cost of living for counties within California, Illinois, Pennsylvania, and Texas. Fournier and Rasmussen (1986) updated this as indicated above for states for 1980, but only for this one Census year. Now the data availability has changed, and there is need to update the index on an annual basis for the 1981-1990 period.

Economic theory suggests that changes in the effective demand for goods and for housing, especially when supplies are not perfectly elastic, can play a large part in the determination of geographical differences in living costs.

The demand function for goods and services in any given locality expresses the quantity demanded primarily as a negative function of price ($\alpha_1 < 0$), a positive function of per capita income in the locality ($\alpha_2 > 0$) and a positive function of both assets in housing, H, and imputed housing user costs ($\alpha_3 H$) which include capital gains and losses:

(1) $$q = \alpha_1 p + \alpha_2 Y + \alpha_3 H + \alpha_4 \Delta P + \mu_1$$

Here p = a price index relevant to goods and services purchased in the area,

q = a market basket of goods and services needed to sustain a family of four at the same level, irrespective of the area,

COL = pq = the cost of living,

Y = per capita personal income in the locality from U.S. Department of Commerce data,

H = value of the house of given size and quality (measured here as the median sales price of existing single-family homes available from the National Association of Realtors (1990),

ΔP = percent change in the population in the area over the preceding five years, and

μ_1 = disturbances.

The structural factors shifting the demand function, Y, H, and DP, have a logical basis in economic theory and can first be considered briefly. Individual income is a critical element in the demand for virtually all goods and services, raising demand by shifting the budget constraint outward when income is higher because most goods are normal goods ($\alpha_2 > 0$). Where supply is inelastic (as in the case of land prices), especially for those items that are not transportable or geographically mobile, this can bid up the price and lead to geographical differences in living costs.

Consumer demand can also be increased by an asset effect, and the value of housing, H, is a significant component of total assets. The Life Cycle Hypothesis of Ando and Modigliani (1963), which with various extensions by Friedman, Heckman, and others dominates the theory of the household, measures it by using the total stock of assets or net worth. But such a comprehensive measure of all assets is less relevant for purposes of analysis of geographical price differences than are the assets specific to the locality in the form of equity in housing. Apart from this asset effect, it is also that land is immobile resulting in an inelastic supply, so that when demand rises, housing prices are driven up which means a higher imputed annual user-cost of housing. Sherwood (1975, p. 14) found that out-of-pocket housing costs vary widely among areas, ranging from an index of 168 in Boston to 68 in Austin, Texas. Using the median sales price of housing in a locality as an index to housing costs and as a measure of past asset accumulation that includes capital gains and losses has the further merit of being a measure that is widely available for all years for many large and small metropolitan areas on an annual basis from the National Association of Realtors (1990), whereas both housing costs and the more comprehensive asset measures are not.

Climatic differences also may have effects on differences in living costs. So we will explore below the merits of using an additional variable for climate, C.

Population growth has ambiguous effects on prices, as was stressed earlier by McMahon and Melton (1978, p. 326). Rapid population growth accompanied by effective purchasing power can increase the pressure on some facilities other than housing, and act to raise their prices (i.e., $\alpha_4 > 0$). However, per capita income is a better measure of effective demand, and because it and H are included as variables explaining per-unit costs, this effect of only population growth (that does not necessarily have the purchasing power) is less likely to be strong. On the other hand, economies of scale in certain services such as schools and city services also can be achieved as pointed out by Alonso (1970, pp. 72-75) (i.e., on the supply side below $\alpha_7 < 0$).[1] The net effect cannot be inferred from economic theory, but because of the large migration toward the south and the sun belt states during the 1980s where economies of scale could be meaningful, the hypothesis is that this relationship will be negative ($\alpha_4 < 0$).

The supply equation expresses price as a positive function of the quantity supplied both in the short run and in the long run ($\alpha_5 > 0$), as well as of housing costs as mentioned above ($\alpha_6 > 0$):

$$p = \alpha_5 q + \alpha_6 H + \alpha_7 \Delta P + \mu_2 \tag{2}$$

where μ_2 = disturbances and all other variables have been defined under equation (1). Assuming linearity, the demand and supply functions may be solved simultaneously eliminating q. The resulting reduced-form price equation then can be multiplied throughout by the appropriate quantity weight $\bar{q}$ representing the market basket of commodities in the standard budget for a family of four. Because these quantity weights are designed to maintain the same level of well being in each area, they are treated as constants and as part of the parameters in equation (3) below. This result contains the key determinants of the cost of living, COL, in each locality:

$$COL = p\bar{q} = \frac{\alpha_2 \bar{q}}{1/\alpha_5 - \alpha_1} Y + \frac{(\alpha_3 + \alpha_6/\alpha_5)\bar{q}}{1/\alpha_5 - \alpha_1} H + \frac{(\alpha_4 + \alpha_7/\alpha_5/\bar{q}}{1/\alpha_5 - \alpha_1} \Delta P + \mu_3 \tag{3}$$

Because $\alpha_1 < 0$, all denominators can be expected to be positive. The first two numerators relating to Y and to H also can be expected to be positive as suggested above, and because the hypothesis is that $\alpha_7 > 0$, the sign of the third numerator is indeterminate.

III. Estimation of the Model

The parameters can be simplified as shown in equation (4), the model to be estimated. Here β_1 and β_2 are expected to be positive, and β_3 to be indeterminate, but probably negative since the positive effects of population increase on the demand side are likely to be picked up by Y and H, whereas the negative effects due to economies of scale and the movement further out and to retirement communities remain:

(4) $$COL = \beta_1 Y + \beta_2 H + \beta_3 \Delta P + \mu$$

The definitions and data sources for the variables are:

COL = Cost of Living Index, for 1981 for 24 MSAs and 4 regional non-metropolitan areas as published by the U.S. Bureau of Labor Statistics (1982, p. 45). These and the ACCRA (1990) measures for the respective sets of states within which sample data for selected localities exists are extended to a statewide basis in 1981 and 1989 respectively by using a weighted average of the MSA and non-metropolitan components of the COL. Weights consist of the percent of the population that is metropolitan vs. non-metropolitan in each state from the U.S. Bureau of the Census.

Y = Per Capita Personal Income, in thousands of dollars. For states this is from U.S. Department of Commerce Survey of Current Business (1990) where it is also available for these MSAs and by county within each state. (Disposable income is not available on an equally consistent basis.)

H = Value of Housing, measured as the median value of an existing one-family home. This is available from the Census of Housing, U.S. Department of Commerce for 1980 only, and from the National Association of Realtors (1990) as reported in the U.S. Statistical Abstract (Table 1236) for 1981-1990.

ΔP = Percent Change in Population, for the preceding five years, from Current Population Reports, Series P-25, U.S. Department of Commerce (1990, p. 16, Table 1), and various other issues.

The results obtained for the regression for the MSAs in 1981, the last year the BLS collected data, and for the regressions using statewide data for the corresponding states for 1981-1990 are shown in Table 1. The signs are all as expected, and the t-statistics indicate that all coefficients reach the 0.05 level of significance or above except for that on Y in a few of the earlier years where it is closer to the 0.10 level of significance. Multicollinearity among the explanatory variables is reasonably low (as shown in Appendix A), with the expected positive simple correlation between Y and H of .38 the highest. The R^2 as shown above is reasonably good for cross section data (and highest in the most recent years).

Turning to the statewide regressions (Eqns. 6-15), the procedure used is one of first constructing a statewide 1981 COL index for the states in which the MSAs are located by weighting the BLS index for the 24 (metropolitan) MSAs and their index for the nonmetropolitan areas by each states' distribution of population as between metropolitan and nonmetropolitan areas. In Table 1, a comparison of Eqs. (5) and (6) reveals regression coefficients for the MSA and statewide data that are very similar. In Appendix A, a test is shown to see if as between the two

Table 1

Major Determinants of Cost of Living Differences

(t-statistics are in parentheses)

MSAs, n = 24:

	Equation	R^2
(5)	1981 COL = .0015Y + .178H − .57ΔP + 74.1	.514
	(0.952) (2.04) (−3.05)	

Statewide (Population Weighted) Means, Based on BLS Data, n=22:

	Equation	R^2
(6)	1981 COL = .002Y + .182H − .56ΔP + 67.6	.552
	(1.63) (2.61) (−2.22)	
(7)	1982 COL = .002Y + .163H − .62ΔP + 74.4	.463
	(1.55) (1.87) (−2.17)	
(8)	1983 COL = .002Y + .191H − .65ΔP + 72.3	.549
	(1.89) (2.23) (−2.24)	
(9)	1984 COL = .002Y + .274H − .90ΔP + 72.4	.635
	(1.77) (3.19) (−2.74)	
(10)	1985 COL = .002Y + .285H − 1.12ΔP + 72.8	.758
	(2.34) (4.63) (−3.65)	
(11)	1986 COL = .002Y + .289H − 1.37ΔP + 74.2	.811
	(2.27) (5.40) (−4.21)	
(12)	1987 COL = .0014Y + .266H − 1.54ΔP + 83.9	.806
	(1.74) (4.96) (−3.70)	
(13)	1988 COL = .002Y + .202H − 1.62ΔP + 84.3	.804
	(2.54) (4.23) (−3.35)	
(14)	1989 COL = .002Y + .154H − 1.40ΔP + 75.3	.778
	(3.40) (3.37) (−2.62)	

Statewide (Population Weighted) Means, Based on ACCRA Data, n = 34

	Equation	R^2
(15)	1989 COL = .002Y + .141H + .01ΔP + 62.5	.870
	(5.44) (7.48) (0.13)	

regressions there is a change in the structure. The null hypothesis cannot be rejected, indicating that there is no significant change. This is not surprising because the inference is that at least the first two variables are structural factors. Also a very high percentage of the population in almost all these 22 states is metropolitan as opposed to nonmetropolitan or rural.

When climate, C, is added to the regression measured as a dummy variable with a value of 0 below the Mason-Dixon line, including California, to reflect the lower heating costs in sun-belt states, especially while oil and related energy prices were very high, the result shown below in Eq. (16) is typical.

$$(16)\qquad 1981\ COL = .0013Y + .233H - .44\Delta P + 5.21C + 68.9 \qquad \frac{R^2}{.575}$$
$$(0.863)\quad (2.63)\quad (-1.64)\quad (1.09)$$

Using "climate" would seem to have more logic than merely using regional dummies. But although the R^2 is slightly higher, the significance of each of the other explanatory variables is reduced in comparison to Eq. (6), and the t-statistic for climate never reaches the 0.05 level in any year from 1981 through 1990. So given this lack of significance, climate was dropped as an explanatory variable.

Other regressions were tested, using population levels in place of the change in the population over time, for example. But when per capita income is included as an explanatory variable, as shown in Eq. (16) below, population level, P, is not insignificant:

$$(17)\qquad 1981COL = .002Y + .172H - .55\Delta P + .00001P + 67.1 \qquad R^2 = .564$$
$$(1.58)\quad (2.39)\quad (-2.09)\quad (0.02)$$

The R^2 is no higher than when P is dropped, as in Eq. (6), and lower than when climate is used instead of P in Eq. (16). This insignificance of population levels when per capita income is included was discovered earlier by Alonso (1970).

It is impossible to test the regressions as shown for years prior to 1981 because the number of MSAs covered in the National Association of Realtors (and hence also the Statistical Abstracts) data on the median sales price of existing housing, H, diminishes and is totally inadequate. However, for further tests on the stability of the coefficients, the SMSA and statewide 1981 COL were updated for the years following 1981 (the latter shown in Table 1) by use of the Consumer Price Index, which shows percentage changes from the base year. For the 24 MSAs, the CPI is available, and the results of a second test for change in the structure from 1981 to 1989 is shown in Appendix A. This again reveals no evidence of significant structural change. For the statewide COL, the percentage increments from the base year in the CPI for metropolitan vs. nonmetropolitan areas were weighted by the percentage of the population living in metropolitan vs. nonmetropolitan areas in each state or region. This weighted percentage change in the CPI then was used to update the base level 1981 COL. The CPI is based on budget studies that reflect the changing budget proportions over time in purchases in each area, and these CPI weights are periodically updated.[2] This method of updating in the sampled areas is also the method used earlier by the BLS to update their own index.

As a further check on the accuracy of the COL estimates in recent years, an independent data source for selected communities in 34 states sampled by the American Chamber of Commerce Research Association was used to create an ACCRA-based statewide COL index for 1989 for these states. The method is the same as that used to create the statewide index based on the BLS sample as described above. Specifically, all of the communities sampled by ACCRA within each state were grouped by PMSA, MSA, and nonmetropolitan areas (using neighboring states in those cases where there was no nonmetropolitan area sampled). The means within each category then were weighted by the proportion of the population in that state in PMSA's (if any), MSA's, and nonmetropolitan areas. The resulting weighted mean COL for each state in which sample data exists was used in a regression containing the same explanatory variables as shown in Eq. (15) in Table 1. There the significance of per capita income, Y, and housing, H, is very high, exceeding the .01 level. The regression coefficient for Y is the same and the coefficient for H is very similar to those in the BLS-based regressions. Population change, ΔP, however is not significant, with $t = 0.13$. Appendix A shows simple correlations among the explanatory variables that are in the same pattern (for this different sample) as for the BLS regressions. A test for differences in the coefficients does reveal a significant difference, undoubtedly due to the difference in the population change coefficient. The statewide COL estimates for the 50 states based on these independent BLS and ACCRA data sources will be compared and discussed shortly below.

All of the regression results suggest that differences in the median sales price of housing emerge as the most significant source of differences in the cost of living, although per capita income also is important. However, the median house prices, H, as reported by the National Association of Realtors overstates increases in constant-quality house prices by about 2 percent a year, as shown by Hendershott and Thibodeau (1990, pp. 328, 333). This overstatement is significantly related to changes in real income (see ibid., 1990). Therefore the increases in prices of a constant-quality house are likely to be somewhat less important, and larger per capita income somewhat more important as determinants of differences in the cost of living than the regression results might suggest, given that H is a fraction of Y. Direct out-of-pocket housing costs account for about 23 percent of a typical household budget, and the imputed own equity contribution due to capital gains and losses which vary together with H are likely to account for even more. Higher per capita income is also especially significant in Connecticut and the Northeast seaboard.

The effect of the percentage growth of population is not a major explanatory variable because its regression coefficient is multiplied by the very small values for ΔP as compared to Y and H, its effect is not only smaller but also insignificant in the ACCRA-based regression. Nevertheless lower costs due to economies of scale in public services and perhaps movement by higher income and retired persons following tax cuts in the 1980s to places like New Hampshire (from Boston) and toward the retirement sunbelt states may still be a minor factor.

IV. Geographical Differences in the Cost of Living The Results

The differences in the cost of living among the 50 states and the District of Columbia are shown in Table 2 with the 1981 U.S. average treated as the base year. The index is obtained using the statewide regression equation (6) shown in Table 1 together with measures of per capita personal income and the median sales price of existing single family homes for each state and for each year from 1981-1990, as well as the percent change in population for the preceding five years for each state from 1977-1990.[3] The cost of living index then was normalized, with the results shown in Table 3, so that 100 represents the national unweighted average for each year for all states.[4]

These results in Table 3 indicate that there is a 42 percent variation in the cost of living in 1990 among states in the continental U.S., and a 57 percent variation if Hawaii and Alaska are included. The higher cost of living states continue to be in the East, Connecticut, New Jersey, and the District of Columbia in particular, plus Alaska and Hawaii. In these places higher incomes, higher prices, and higher housing costs are all a factor. The lower living cost states are those in the South, such as Mississippi, Arkansas, Alabama, South Carolina, Arizona, and New Mexico, where there are lower heating costs, and less population density may contribute to lower costs of land. The Midwestern and North Central states remain in the middle.

Table 4 shows the normalized cost of living index for 1989 based on the ACCRA regression (Eqn. 15) compared to the 1989 index based on the BLS data. These are rank ordered from highest to lowest cost using the ACCRA-based index. The percentage differences shown on the right are quite small, considering the differences in the concepts discussed below, with a difference of less than 3.3 percent between the estimates in 75 percent of the states. The differences range from 0 percent (when rounded) in North Carolina, Nebraska, Wyoming, Oregon, Texas and Utah to a high of -8.23 percent in Arizona, +7.56 percent in Missouri, +7.03 percent in Rhode Island, and -6.58 percent in New Mexico.

Examination of the reasons for these differences reveals three sources, that may be useful to those wishing to make evaluative judgments in the use of the results:

1. In a few states where there are very large cities, the ACCRA samples are sometimes confined to one suburb that may not be representative, e.g., Nassau-Suffolk to represent New York, Schaumburg for Chicago.

This appears most frequently to lead to a small over-estimate of costs by the ACCRA-based index.

2. In other states there are large cities that are not sampled by ACCRA (e.g., Providence, RI and Alexandra, VA), or that are grouped by the U.S. Census with the MSAs even though they contain more people (e.g., St. Louis and Kansas City, MO). Since they are underrepresented, this could lead to an underestimate of costs using the ACCRA-based index in these states.

3. Some states have had a huge influx of population in the five years leading up to 1989 (e.g., Arizona +16.7 percent, Florida + 14.6 percent, 7.1 percent in New Mexico, and 15.5 percent in New Hampshire). This could contribute to some understatement of the true cost of living by the BLS-based index for these places. There are no percentage losses of population in any state that are anywhere near this large.

4. Beyond this, there is the more general point that the ACCRA-based index uses the same budget weights on prices in all regions (e.g., no heavier weight for the higher heating costs in Maine). So the concept is slightly different, and the ACCRA index is perhaps somewhat closer to a geographical price index than to a cost of living index.

Therefore some differences in the BLS-based and ACCRA-based statewide indices are to be expected. But overall, the relatively small percentage differences in the two estimates, the very small differences in the range from highest to the lowest, and the reasonably close correspondence in the rank order serve to increase confidence in the accuracy of the estimates in Table 3, perhaps substituting the ACCRA-based statewide estimate in those three or four states indicated in point #3 above that have had extraordinarily large increases in population in the late 80's.

With respect to changes over time, the pattern remains much the same as in McMahon and Melton (1977). Living costs in Massachusetts, Connecticut, District of Columbia, Alaska and Hawaii, which were high in 1977, now are relatively even higher. And the lower cost of living areas such as Kentucky, Louisiana, Mississippi, West Virginia and Wyoming now are relatively even lower. The recession in the farm states throughout the 1980's lowered living costs there since 1977 relative to the other states, and the industrial recession in 1981-83 lowered per capita incomes and relative living costs in the industrial states. But then the later industrial recovery from 1983-89 also appears to have been a factor in raising demand and costs. In this recovery period, increases in the cost of living begin to occur in Massachusetts, Virginia, and parts of the industrial midwest that perhaps have been arrested by the 1991 recession.

Table 2
Geographical Cost of Living Index, by State, 1981-1990 *

COL	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Connecticut	109.14	111.25	114.55	119.19	123.86	131.75	140.46	146.19	149.46	148.63
Maine	93.60	95.03	97.93	100.74	103.42	109.15	114.27	118.42	122.35	122.39
Massachusetts	104.74	106.75	108.64	114.37	120.18	127.06	133.28	138.69	142.22	142.77
New-Hampshire	94.02	96.33	99.50	105.89	108.45	113.89	119.13	124.13	125.67	125.25
Rhode-Island	99.02	100.64	103.32	106.24	108.42	113.56	121.21	125.13	127.57	129.29
Vermont	93.61	94.79	96.99	99.57	103.43	109.14	114.21	118.60	121.86	122.54
Delaware	102.56	104.02	106.83	109.65	112.53	116.10	122.65	125.76	128.26	130.50
Dis-Columbia	117.86	119.58	121.31	123.02	124.81	126.10	132.73	139.58	146.25	148.58
Maryland	102.61	105.22	107.36	110.06	113.01	114.94	118.26	121.66	126.06	128.28
New-Jersey	106.28	108.19	111.91	116.24	120.27	125.42	133.68	139.65	143.64	145.96
New-York	104.12	105.47	107.99	111.25	114.83	118.94	123.38	128.22	132.32	134.90
Pennsyvania	100.78	102.07	103.36	105.64	108.32	111.09	114.14	116.75	119.53	121.15
Illinois	102.85	104.30	105.97	108.50	110.24	112.67	114.89	118.36	121.60	124.08
Indiana	97.02	98.09	100.06	102.48	104.16	106.46	108.36	110.28	113.51	115.38
Michgan	98.62	99.77	102.09	105.09	107.74	109.98	111.37	113.35	116.14	118.41
Ohio	99.35	100.88	102.84	105.01	106.80	108.79	110.34	112.15	114.91	117.01
Wisconsin	98.59	100.11	101.77	104.37	106.18	108.12	109.73	111.17	116.01	117.93
Iowa	99.36	99.97	100.71	103.18	104.89	107.63	108.95	109.94	112.68	115.25
Kansas	97.24	100.62	101.47	103.31	105.72	108.15	110.04	111.93	113.69	115.27
Minnesota	101.73	103.30	104.87	108.09	110.18	112.41	114.52	116.38	118.96	120.85
Missouri	98.05	99.94	101.65	104.33	106.75	108.96	110.65	112.82	114.95	116.29
Nebraska	98.85	99.79	100.57	102.81	104.92	106.80	108.26	109.64	111.71	114.91
North-Dakota	96.77	97.14	97.59	98.90	100.16	102.71	104.86	105.70	109.41	110.62
South-Dakota	95.83	96.43	96.90	98.54	99.31	101.61	103.14	103.53	106.70	108.73
Alabama	92.28	93.79	95.78	97.93	99.08	101.19	102.87	104.50	107.38	108.60
Arkansas	91.30	93.09	94.96	97.27	99.57	100.85	101.50	102.94	105.45	107.25
Florida	93.19	92.97	96.42	99.02	102.04	104.22	106.43	108.73	112.23	114.78
Georgia	93.38	94.97	97.14	100.25	101.85	104.58	106.69	108.72	111.76	112.00
Kentucky	92.93	93.87	94.88	97.65	98.94	103.11	105.60	108.15	109.37	110.81
Louisiana	95.64	96.91	97.82	99.95	101.82	101.97	103.39	105.85	107.92	110.11
Mississippi	93.19	94.64	96.00	97.81	98.78	99.31	100.51	102.04	103.82	104.65
North-Carolina	95.95	97.56	99.67	102.12	104.14	106.97	110.15	111.65	115.37	117.34
South-Corolina	90.80	92.29	94.39	96.63	98.59	100.72	102.34	103.83	106.36	108.62
Tennessee	92.46	94.55	96.64	99.69	101.54	103.40	105.72	107.90	110.24	111.04
Virginia	99.07	100.97	104.43	107.78	111.27	116.16	122.98	127.13	130.01	131.35
West-Virginia	92.04	94.03	94.92	96.74	98.64	100.73	102.67	105.12	108.78	110.98
Arizona	91.74	92.99	94.80	98.37	100.19	101.79	103.45	104.82	106.65	108.24
New-Mexico	93.55	95.00	95.09	96.98	99.27	100.82	102.64	104.45	106.88	108.73
Oklahoma	95.06	95.89	95.05	97.98	100.46	102.02	105.15	108.28	110.24	112.46
Texas	94.25	95.47	95.97	99.17	101.74	102.55	104.99	108.56	111.29	113.70
Colorado	99.02	100.78	102.46	106.23	108.16	110.56	113.27	115.42	118.74	120.93
Idaho	88.74	89.92	92.86	94.98	96.39	98.41	101.18	103.47	105.80	108.67
Montana	94.30	95.21	96.43	97.55	97.56	100.38	103.12	105.38	108.60	110.95
Utah	88.91	88.21	89.86	93.00	95.96	98.23	100.55	102.75	105.39	106.68
Wyoming	88.51	89.25	90.88	95.55	100.07	102.57	106.65	111.28	112.51	115.05
California	108.41	109.72	111.54	114.20	117.66	120.90	125.02	132.79	140.16	143.92
Nevada	90.90	92.26	95.42	100.21	103.68	106.91	108.65	110.19	112.95	116.97
Oregon	93.12	95.44	99.20	102.69	104.80	106.52	107.94	109.57	111.72	115.37
Washington	95.12	97.01	100.35	103.74	106.12	108.47	109.87	111.52	115.59	120.37
Alaska	118.97	118.06	116.64	113.75	114.97	116.88	123.96	136.33	148.85	158.61
Hawaii	111.89	111.58	113.87	115.52	121.21	125.15	129.62	138.34	151.20	164.68
U.S. Avg (Unweighted)	97.79	99.14	100.97	103.71	106.14	108.96	112.14	115.25	118.64	120.94

* Base year is 1981, where the U.S. average of BLS SMSA index = 100.

Table 3
Normalized Geographical Cost of Living Index, by State, 1981-1990
(Unweighted mean for each year = 100)

Normalized Col	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Connecticut	111.60	112.21	113.44	114.92	116.70	120.92	125.25	126.85	125.98	122.89
Maine	95.71	95.85	96.99	97.14	97.44	100.17	101.89	102.75	103.13	101.20
Massachusetts	107.11	107.67	107.59	110.28	113.23	116.61	118.85	120.34	119.87	118.05
New-Hampshire	96.14	97.17	98.54	102.10	102.18	104.52	106.22	107.70	105.93	103.57
Rhode-Island	101.25	101.52	102.32	102.44	102.15	104.22	108.08	108.58	107.52	106.91
Vermont	95.72	95.62	96.05	96.00	97.44	100.17	101.85	102.91	102.72	101.32
Delaware	104.88	104.92	105.80	105.73	106.02	106.55	109.37	109.12	108.11	107.91
Dis-Columbia	120.53	120.61	120.14	118.62	117.59	115.73	118.35	121.11	123.27	122.86
Maryland	104.92	106.14	106.33	106.13	106.48	105.49	105.45	105.57	106.25	106.07
New-Jersey	108.69	109.13	110.83	112.08	113.32	115.11	119.20	121.17	121.07	120.69
New-York	106.47	106.39	106.95	107.27	108.19	109.16	110.02	111.26	111.53	111.54
Pennsyvania	103.06	102.96	102.36	101.86	102.06	101.96	101.78	101.30	100.75	100.18
Illinois	105.17	105.20	104.95	104.62	103.86	103.41	102.45	102.70	102.49	102.60
Indiana	99.21	98.94	99.10	98.81	98.14	97.71	96.63	95.69	95.67	95.41
Michgan	100.84	100.63	101.11	101.33	101.50	100.94	99.31	98.36	97.89	97.91
Ohio	101.59	101.76	101.84	101.25	100.62	99.85	98.39	97.31	96.86	96.75
Wisconsin	100.81	100.98	100.79	100.64	100.04	99.23	97.84	96.46	97.78	97.51
Iowa	101.60	100.84	99.74	99.49	98.82	98.79	97.15	95.39	94.98	95.30
Kansas	99.44	101.50	100.49	99.62	99.61	99.26	98.12	97.12	95.83	95.32
Minnesota	104.03	104.20	103.85	104.22	103.81	103.17	102.12	100.98	100.27	99.93
Missouri	100.27	100.81	100.67	100.60	100.57	100.01	98.66	97.89	96.89	96.16
Nebraska	101.08	100.66	99.60	99.13	98.85	98.02	96.53	95.13	94.16	95.02
North-Dakota	98.96	97.98	96.65	95.37	94.36	94.26	93.50	91.72	92.22	91.47
South-Dakota	98.00	97.27	95.97	95.01	93.57	93.26	91.97	89.83	89.94	89.91
Alabama	94.36	94.60	94.85	94.43	93.35	92.87	91.73	90.67	90.51	89.80
Arkansas	93.36	93.90	94.05	93.79	93.81	92.56	90.51	89.32	88.88	88.68
Florida	95.29	93.77	95.49	95.48	96.14	95.65	94.90	94.34	94.59	94.91
Georgia	95.49	95.80	96.20	96.66	95.96	95.98	95.13	94.33	94.20	92.61
Kentucky	95.03	94.68	93.96	94.16	93.22	94.63	94.16	93.84	92.18	91.63
Louisiana	97.81	97.75	96.88	96.37	95.93	93.59	92.19	91.84	90.97	91.05
Mississippi	95.30	95.46	95.08	94.31	93.07	91.14	89.62	88.54	87.51	86.53
North-Carolina	98.12	98.40	98.71	98.46	98.12	98.18	98.22	96.87	97.25	97.02
South-Corolina	92.85	93.09	93.48	93.18	92.89	92.44	91.25	90.09	89.65	89.81
Tennessee	94.55	95.37	95.70	96.12	95.67	94.90	94.27	93.62	92.91	91.81
Virginia	101.31	101.85	103.42	103.92	104.83	106.61	109.66	110.31	109.58	108.61
West-Virginia	94.12	94.85	94.00	93.28	92.93	92.45	91.55	91.21	91.69	91.76
Arizona	93.82	93.80	93.89	94.85	94.40	93.42	92.24	90.95	89.89	89.50
New-Mexico	95.66	95.83	94.18	93.51	93.53	92.53	91.52	90.63	90.09	89.91
Oklahoma	97.21	96.72	94.14	94.47	94.65	93.64	93.76	93.95	92.91	92.99
Texas	96.38	96.30	95.05	95.62	95.86	94.12	93.62	94.19	93.81	94.01
Colorado	101.26	101.66	101.47	102.43	101.90	101.47	101.01	100.15	100.08	99.99
Idaho	90.74	90.70	91.96	91.58	90.81	90.32	90.22	89.78	89.18	89.85
Montana	96.43	96.04	95.50	94.06	91.91	92.12	91.95	91.44	91.54	91.74
Utah	90.92	88.98	88.99	89.67	90.41	90.15	89.66	89.15	88.83	88.21
Wyoming	90.51	90.03	90.01	92.13	94.28	94.14	95.10	96.55	94.83	95.14
California	110.86	110.68	110.46	110.11	110.86	110.96	111.48	115.22	118.14	119.01
Nevada	92.96	93.06	94.50	96.63	97.68	98.12	96.88	95.61	95.20	96.72
Oregon	95.22	96.27	98.25	99.02	98.74	97.77	96.25	95.07	94.16	95.40
Washington	97.27	97.85	99.39	100.03	99.98	99.56	97.97	96.76	97.43	99.53
Alaska	121.66	119.08	115.52	109.68	108.32	107.27	110.54	118.29	125.46	131.15
Hawaii	114.42	112.54	112.77	111.39	114.20	114.86	115.59	120.04	127.44	136.17
U.S. Avg (Unweighted)	100	100	100	100	100	100	100	100	100	100

Table 4

ide COL Index via Prediction Equation and ACCRA Sample Compared

1989

P.E. ank	STATE	Prediction Equation Normalized COL	ACCRA Normalized COL	ACCRA COL Non-normalized	Difference between P.E. and ACCRA Normalized COL
3	Alaska	125.46	129.15	133.14	-2.85%
1	Hawaii	127.44	128.52	132.50	-0.84%
2	Connecticut	125.98	125.22	129.09	0.61%
4	Dis-Columbia	123.27	121.71	125.48	1.28%
5	New-Jersey	121.07	118.39	122.05	2.26%
6	Massachusetts	119.87	115.73	119.31	3.58%
8	New-York	111.53	115.44	119.01	-3.39%
7	California	118.14	113.66	117.18	3.94%
13	New-Hampshire	105.93	110.04	113.44	-3.74%
10	Delaware	108.11	109.25	112.63	-1.05%
17	Pennsyvania	100.75	107.88	111.22	-6.62%
12	Maryland	106.25	104.60	107.84	1.57%
9	Virginia	109.58	103.84	107.05	5.53%
16	Illinois	102.49	103.27	106.46	-0.75%
20	Michigan	97.89	103.05	106.24	-5.01%
31	Florida	94.59	100.68	103.79	-6.04%
11	Rhode-Island	107.52	100.46	103.57	7.03%
22	Washington	97.43	99.01	102.07	-1.59%
14	Maine	103.13	98.13	101.17	5.09%
46	Arizona	89.89	97.95	100.98	-8.23%
15	Vermont	102.72	97.44	100.45	5.42%
23	North-Carolina	97.25	97.34	100.35	-0.10%
28	Nevada	95.20	97.04	100.04	-1.89%
44	New-Mexico	90.09	96.44	99.42	-6.58%
21	Wisconsin	97.78	95.76	98.72	2.12%
18	Minnesota	100.27	95.47	98.42	5.03%
32	Georgia	94.20	95.19	98.13	-1.03%
19	Colorado	100.08	95.13	98.07	5.21%
25	Ohio	96.86	94.90	97.84	2.06%
34	Nebraska	94.16	94.59	97.52	-0.46%
30	Wyoming	94.83	94.39	97.31	0.47%
33	Oregon	94.16	94.29	97.21	-0.14%
42	Louisiana	90.97	94.23	97.15	-3.47%
35	Texas	93.81	93.86	96.76	-0.05%
27	Indiana	95.67	93.85	96.75	1.94%
38	North-Dakota	92.22	93.65	96.55	-1.53%
41	Montana	91.54	93.60	96.50	-2.21%
29	Iowa	94.98	93.30	96.19	1.79%
43	Alabama	90.51	92.79	95.66	-2.46%
45	South-Dakota	89.94	92.65	95.52	-2.93%
47	South-Carolina	89.65	92.09	94.94	-2.65%
26	Kansas	95.83	91.79	94.63	4.40%
36	Tennessee	92.91	91.68	94.52	1.34%
49	Arkansas	88.88	91.54	94.37	-2.91%
48	Idaho	89.18	90.62	93.42	-1.59%
39	Kentucky	92.18	90.60	93.40	1.75%
51	Mississippi	87.51	90.50	93.30	-3.30%
37	Oklahoma	92.91	90.21	93.00	3.00%
24	Missouri	96.89	90.07	92.86	7.56%
40	West-Virginia	91.69	89.95	92.73	1.94%
50	Utah	88.83	89.06	91.81	-0.25%
	U.S. Unweighted Ave.	100.00	100.00	103.09	0.02%

V. Cost Differences Within States

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Differences in the cost of living among large cities, medium sized cities, and nonmetropolitan areas in each state are developed in Table 5 based on the ACCRA data collected for selected cities. These results will be compared to cost of living estimates for each county in Illinois (Table 6) and metropolitan nonmetropolitan differences based on these independent BLS-based regressions (in Table 7). The results of the two independent approaches again are reinforcing. But the results also again reveal some locations where there appear to be sampling errors in the means that are based on the ACCRA data.

Metropolitan-Nonmetropolitan Differences

To estimate differences in the cost of living between larger cities and nonmetropolitan areas, all of the locations sampled by ACCRA were first grouped within each state by PMSA (> 1.5 million population), MSA (1.5m-50,000) and nonmetropolitan areas (< 50,000). Since many states have no cities large enough to be a PMSA, there are blanks for these states in column 1 of Table 5. Where there were no nonmetropolitan area data collected (see * in Column 3), or where the ACCRA data is for only one location (see c in Table 5) the state was pooled with data for the same city size class in adjacent states. For some of the very largest cities such as San Francisco and Chicago, ACCRA has collected data for only one suburb (marked b in column 1, Table 5). In these cases a regression equation based on housing values, per capita personal income, and population change is used to obtain the estimate shown. Estimates at this level of detail should be used with some caution, and with one eye to the cities in which data was actually collected by ACCRA because there is some variation within each size category. Nevertheless certain patterns emerge.

The cost of living is distinctly higher in larger cities, and only slightly higher in the medium sized metropolitan areas from that in nonmetropolitan towns of < 50,000. There is a 74 percent difference in the cost of living as between the higher cost cities and the lowest nonmetropolitan areas in the U.S. This is larger than the 57 percent variation in the state averages in Table 3, as might be expected. But even within the same state, the real purchasing power of the persons living in the largest cities is 22 to 35 percent below the purchasing power of those living in medium sized cities and nonmetropolitan areas respectively.

Table 5 Cost of Living Index, 1989
For Large Cities, Metropolitan Areas, and Non-Metropolitan Areas

STATE	Large City (Pop > 1.5 m)	MSA's (1.5 m.-50,000)	Non-metropolitan (Pop < 50,000)
Alabama		96.02	94.90 *
Alaska		127.60	137.10
Arizona		101.15	100.43
Arkansas		96.30	93.10
California		118.75	99.25 *
Anaheim-Santa Ana	130.90		
Los Angeles-Long Beach	129.20		
Riverside-San Bernardino	110.36		
San Francisco	151.84 b		
San Jose	129.90		
Colorado		99.63	93.45
Denver	102.10		
Connecticut		131.75	99.33 *
Delaware		112.85 c	102.80
Dis-Columbia		125.50 *	
Florida		101.08	97.20
Miami-Hialeah	113.50		
Georgia		98.95 c	98.30
Hawaii		132.50 *	132.50
Idaho		96.10	92.75
Illinois		105.56	97.35
Chicago	120.10 b		
Indiana		96.77	95.46 c
Iowa		96.50	95.95
Kansas		98.85	89.80
Kentucky		95.97	91.20
Louisiana		98.80	93.45 *
Maine		104.00 *	99.30 *
Maryland		108.30	101.80 *
Massachusetts		120.25	99.30 *
Michigan		106.93	103.50
Detroit	117.63 b		
Minnesota		100.03	95.23 *
Mississippi		96.02 a	93.30
Missouri		94.45	88.95
Montana		95.61 *	93.86 *
Nebraska		92.45	89.33
Nevada		106.87 d	104.40 d
New-Hampshire		122.30	99.33 *
New-Jersey		122.05 c	122.05 c
Newark	122.05 c		
New-Mexico		100.85	98.06
New-York		105.82	99.50 c
Nassau-Suffolk	137.73 b		
New York	131.48 b		
North-Carolina		99.19	96.80
North-Dakota		98.60	95.23
Ohio		98.29	96.07
Cleveland	111.94 b		
Oklahoma		93.75	87.00
Oregon		99.00	94.90
Pennsyvania		104.60	99.50
Philadelphia	129.20		
Pittsburgh	106.10		
Rhode-Island		103.96 *	99.33 *
South-Corolina		96.40	92.70
South-Dakota		96.90	94.95
Tennessee		95.30	92.93
Texas		95.89	94.05
Dallas	104.20		
Houston	99.10		
Utah		92.10	90.80
Vermont		103.96 *	99.33 *
Virginia		113.27	101.80
Washington		97.42	92.70
Seattle	113.20		
West-Virginia		93.87	92.07 *
Wisconsin		99.80	96.10
Wyoming		95.61 c	93.86 c

*. Data is not available, so the index uses data from an adjacent state (or city).

a. Data is the same as Alabama, because there are no MSA's in Mississippi.

b. COL predicted using regression equation based on BLS sample, as explained in McMahon (1991). It uses data on housing values, per capita personal income, and population change specific to each large city. The resulting predicction for each city indicated (b) is before normalization to a statewide base of 100. To accomplish this adjustment, a regression equation was computed in each case for a neighboring city that does have ACCRA data, and the ratio of the BLS based prediction to the ACCRA estimate in the neighboring city is used to "normalize" the BLS-equation predictions to the same base.

c. The data presented by ACCRA data is incomplete and is not representative, or is missing, so the regional index for the respective MSA's or Non-metropolitan areas is used.

d. For Nevada MSA's and Non-metropolitan areas respectively, 1989 and 1990 ACCRA data is pooled.

By Counties

Differences in the cost of living by counties in Illinois have been estimated using the BLS-based regression equation and data on 1989 per capita income, housing values, and population change for each county. The results shown in Table 6 are normalized to a statewide average of 100 using first a mean weighted by the population of each county, and then an unweighted mean giving equal weight to each county. The population weighted mean is more relevant where expenditure are being distributed (as in a state school aid formula), whereas the unweighted mean would be more relevant to an individual trying to decide whether or not to move from one location to another. However, when the counties are rank ordered, the rank order is totally unaffected by the type of mean that is used for normalization, and the percentage difference from the highest to the lowest is not significantly affected.

The pattern of estimated cost of living differences within Illinois is illustrated in the map in Figure 1 (normalized using the unweighted mean). There is a 62 percent variation from the highest (Lake County) to the lowest (Johnson County) cost of living location, close to the 57 percent variation among the state-wide averages but smaller than the 74 percent variation between the larger cities (San Francisco, New York) and the lowest cost nonmetropolitan areas (in Missouri, Kansas, and Oklahoma).

When Illinois counties are grouped by PMSA, MSA, and nonmetropolitan areas as shown in Table 7, and rank ordered by cost of living within each group, the pattern discussed above based on the ACCRA data again emerges. The population-weighted mean within each group of counties is within 1.6 percent of the ACCRA-based estimates in all cases as shown at the bottom of Table 7.

VI. Potential Applications to Education in Illinois

The implication of using regional cost differences such as those presented here based in the cost of living in state school aid formulas requires brief comment.

The cost of living index could be made specific to each school district using the regression equation presented in this paper based on the 1989 ACCRA data (Eqn 15). Personal income per capita is available by school district based on state income tax returns. For 1990 the taxpayer was given a list of four digit school codes which greatly improves the accuracy of the reporting. Percentage change in population is available only by county, but since this variable is not significant, the county-wide change may be a suitable proxy. Median house prices are not available by school district for recent years, but the Housing Census for 1990-91 may make these available eventually. The alternatives to this would be to use the county cost of living estimates (Table 6) or the large city metropolitan-nonmetropolitan averages relevant to each school district.

Table 6

Cost of living by County in Illinois

COUNTY	1989 Normalized Weighted COL	1989 Normalized Unweighted COL
Adams	90.73	102.53
Alexander	78.23	88.41
Bond	84.82	95.86
Boone	93.94	106.17
Brown	89.07	100.66
Bureau	90.86	102.68
Calhoun	84.09	95.04
Carroll	88.49	100.00
Cass	86.16	97.37
Champaign	90.39	102.15
Christian	87.44	98.82
Clark	83.46	94.32
Clay	84.32	95.29
Clinton	89.28	100.90
Coles	85.37	96.48
Cook	105.32	119.03
Crawford	89.04	100.63
Cumberland	81.98	92.64
De Kalb	92.92	105.02
De Witt	87.54	98.93
Douglas	84.38	95.36
Du Page	113.54	128.32
Edgar	86.07	97.27
Edwards	85.38	96.49
Effingham	86.99	98.31
Fayette	82.24	92.94
Ford	91.26	103.14
Frinklin	83.73	94.62
Fulton	88.19	99.66
Gallatin	84.23	95.19
Greene	80.99	91.53
Grundy	95.52	107.95
Hamilton	81.41	92.01
Hancock	86.10	97.31
Hardin	78.06	88.22
Henderson	83.63	94.51
Henry	90.76	102.57
Iroquios	87.56	98.95
Jackson	85.49	96.62
Jasper	85.34	96.45
Jefferson	87.62	99.02
Jersey	84.22	95.18
Jo Daviess	88.80	100.35
Johnson	70.42	79.58
Kane	100.05	113.07
Kankakee	89.16	100.76
Kendall	102.30	115.61
Knox	84.42	95.41
La Salle	89.88	101.58
Lake	114.39	129.27
Lawrence	87.87	99.30

COUNTY	1989 Normalized Weighted COL	1989 Normalized Unweighted
Lee	89.27	100.89
Livingston	90.19	101.92
Logan	87.35	98.71
Macon	92.48	104.51
Macoupin	85.05	96.11
Madison	89.43	101.06
Marion	84.91	95.96
Marshall	92.88	104.97
Mason	88.19	99.67
Massac	80.05	90.46
McDonough	85.68	96.83
McHenry	95.84	108.31
McLean	92.19	104.19
Menard	88.92	100.49
Mercer	89.13	100.73
Monroe	98.60	111.43
Montogomery	85.08	96.15
Morgan	88.55	100.07
Moultrie	86.93	98.24
Ogle	92.52	104.56
Peoria	95.88	108.35
Perry	85.91	97.09
Piatt	91.01	102.85
Pike	83.47	94.33
Pope	76.90	86.90
Pulaski	76.18	86.09
Putnam	94.87	107.21
Randolph	83.70	94.59
Richland	88.80	100.35
Rock Island	93.60	105.78
Saline	87.01	98.34
Sangamon	93.86	106.07
Schuyler	85.19	96.27
Scott	84.41	95.39
Shelby	84.52	95.52
Stark	92.37	104.39
Stephenson	93.61	105.79
St. Clair	86.97	98.29
Tazewell	93.92	106.14
Union	83.24	94.07
Vermilion	86.69	97.97
Wabash	88.26	99.75
Warren	89.05	100.64
Washington	87.44	98.82
Wayne	87.33	98.70
White	87.20	98.54
Whiteside	90.22	101.96
Will	95.90	108.38
Williamson	84.12	95.06
Winnebago	95.28	107.68
Woodford	92.00	103.97
Population-Weighted COL Mean	100	
Unweighted COL Mean		100

Table 7

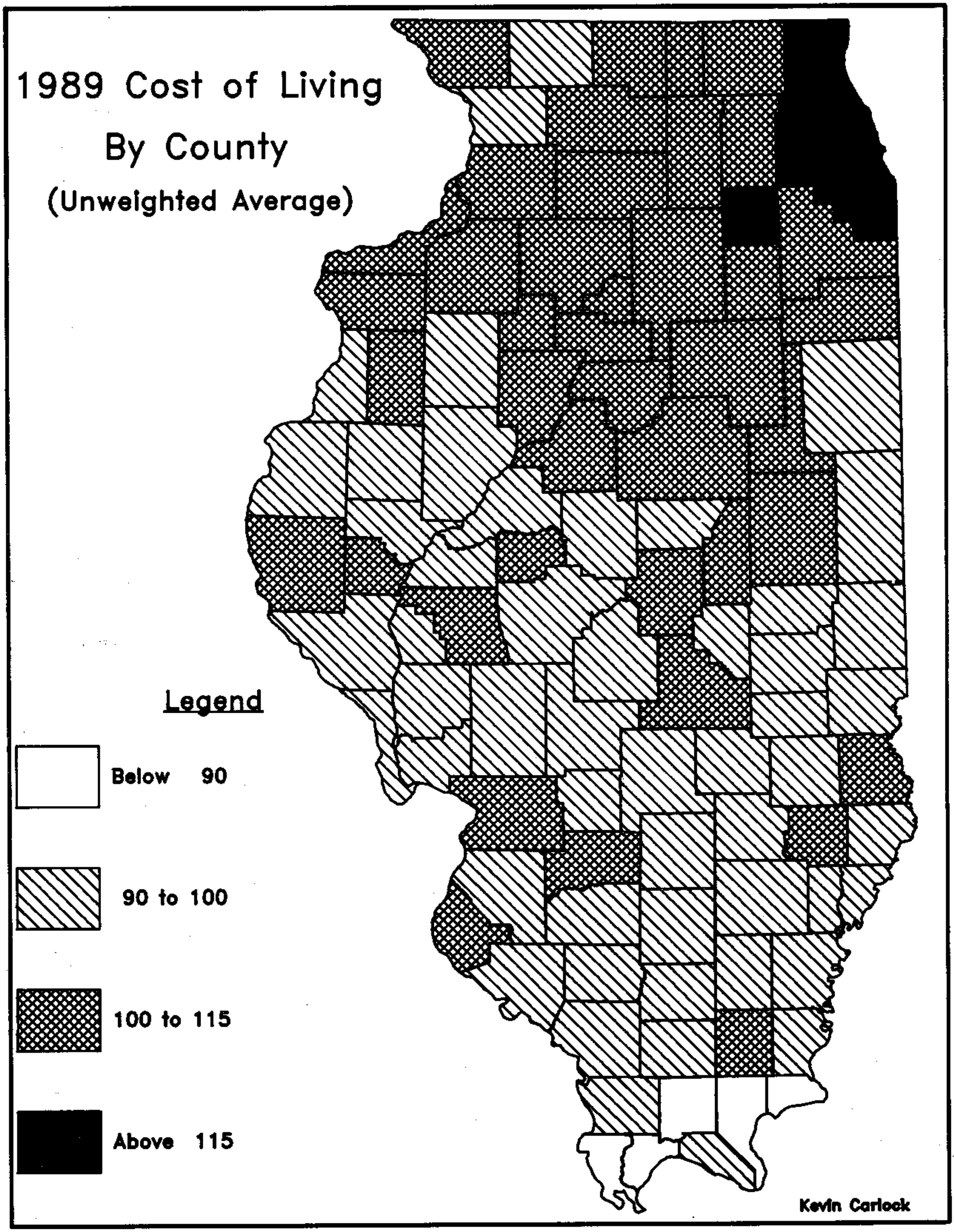
<u>Regional Cost Differences Within Illinois</u>
<u>Comparison of BLS-Based County and ACCRA-Based Estimates</u>
<u>for PMSAs, MSAs, and NonMet. Areas</u>
As shown on the Illinois map (Figure 1)

Rank	COUNTY	1989 Normalized Unweighted COL	1988 Pop	1988 % of Total Pop	
	PMSA				
1	Lake	129.27	495300	6.65	859.88
2	Du Page	128.32	760800	10.22	1311.09
3	Cook	119.03	5284300	70.97	8446.92
4	Kendall	115.61	38600	0.52	59.93
5	Kane	113.07	316800	4.25	481.06
7	Will	108.38	346700	4.66	504.63
9	McHenry	108.31	171100	2.30	248.87
10	Grundy	107.95	32500	0.44	47.12
	Total Population		7446100	100.00	
	Population-Weighted Mean				119.59
	MSA				
6	Monroe	111.43	22200	1.02	113.57
8	Peoria	108.35	182700	8.39	908.83
11	Winnebago	107.68	252100	11.57	1246.22
13	Boone	106.17	30100	1.38	146.71
14	Tazewell	106.14	124800	5.73	608.11
15	Sangamon	106.07	180000	8.26	876.54
16	Stephenson	105.79	49300	2.26	239.45
17	Rock Island	105.78	155600	7.14	755.66
21	Macon	104.51	123700	5.68	593.53
23	McLean	104.19	124700	5.72	596.46
24	Woodford	103.97	32900	1.51	157.03
28	Henry	102.57	53300	2.45	250.98
30	Champaign	102.15	172100	7.90	807.08
34	Madison	101.06	252300	11.58	1170.63
35	Clinton	100.90	34200	1.57	158.42
37	Kankakee	100.76	97900	4.49	452.85
61	St. Clair	98.29	269700	12.38	1216.97
84	Jersey	95.18	20600	0.95	90.01
	Total Population		2178200	100.00	
	Population-Weighted Mean				103.89
	NONMETROPOLITAN AREAS				
12	Putnam	107.21	5700	0.29	30.70
18	De Kalb	105.02	76000	3.82	400.99
19	Marshall	104.97	13200	0.66	69.61
20	Ogle	104.56	46200	2.32	242.70
22	Stark	104.39	6600	0.33	34.62
25	Ford	103.14	14700	0.74	76.17
26	Piatt	102.85	16200	0.81	83.71
27	Bureau	102.68	36800	1.85	189.85
29	Adams	102.53	67600	3.40	348.23
31	Whiteside	101.96	62500	3.14	320.16
32	Livingston	101.92	40400	2.03	206.88
33	La Salle	101.58	107300	5.39	547.59
36	Lee	100.89	34800	1.75	176.39
38	Mercer	100.73	18200	0.91	92.10
39	Brown	100.66	5000	0.25	25.29
40	Warren	100.64	20100	1.01	101.63
41	Crawford	100.63	20100	1.01	101.62
42	Menard	100.49	11700	0.59	59.07
43	Jo Daviess	100.35	23100	1.16	116.47
44	Richland	100.35	16900	0.85	85.20
45	Morgan	100.07	37300	1.87	187.53

Rank	COUNTY	1989 Normalized Unweighted COL	1988 Pop	1988 % of Total Pop	
46	Carroll	100.00	17500	0.88	87.93
47	Wabash	99.75	13800	0.69	69.16
48	Mason	99.67	17400	0.87	87.13
49	Fulton	99.66	38500	1.93	192.78
50	Lawrence	99.30	16900	0.85	84.32
51	Jefferson	99.02	37400	1.88	186.07
52	Iroquios	98.95	31600	1.59	157.09
53	De Witt	98.93	17500	0.88	86.98
54	Christian	98.82	35600	1.79	176.75
55	Washington	98.82	15600	0.78	77.45
56	Logan	98.71	31600	1.59	156.72
57	Wayne	98.70	17800	0.89	88.26
58	White	98.54	17200	0.86	85.15
59	Saline	98.34	27900	1.40	137.84
60	Effingham	98.31	32600	1.64	161.01
62	Moultrie	98.24	14400	0.72	71.07
63	Vermilion	97.97	90600	4.55	445.94
64	Cass	97.37	13900	0.70	68.00
65	Hancock	97.31	22800	1.15	111.46
66	Edgar	97.27	20500	1.03	100.18
67	Perry	97.09	21700	1.09	105.85
68	McDonough	96.83	34200	1.72	166.38
69	Jackson	96.62	59600	2.99	289.31
70	Edwards	96.49	7900	0.40	38.30
71	Coles	96.48	52200	2.62	253.02
72	Jasper	96.45	11200	0.56	54.27
73	Schuyler	96.27	7800	0.39	37.73
74	Montogomery	96.15	31900	1.60	154.11
75	Macoupin	96.11	49200	2.47	237.58
76	Marion	95.96	43300	2.18	208.75
77	Bond	95.86	16100	0.81	77.54
78	Shelby	95.52	23600	1.19	113.25
79	Knox	95.41	56200	2.82	269.40
80	Scott	95.39	6100	0.31	29.24
81	Douglas	95.36	19600	0.98	93.90
82	Clay	95.29	14900	0.75	71.34
83	Gallatin	95.19	7200	0.36	34.44
85	Williamson	95.06	58200	2.92	277.97
86	Calhoun	95.04	5600	0.28	26.74
87	Frinklin	94.62	42000	2.11	199.66
88	Randolph	94.59	35600	1.79	169.18
89	Henderson	94.51	8900	0.45	42.26
90	Pike	94.33	17900	0.90	84.84
91	Clark	94.32	16400	0.82	77.72
92	Union	94.07	18000	0.90	85.08
93	Fayette	92.94	21900	1.10	102.26
94	Cumberland	92.64	10900	0.55	50.73
95	Hamilton	92.01	8900	0.45	41.14
96	Greene	91.53	16000	0.80	73.58
97	Massac	90.46	15000	0.75	68.17
98	Alexander	88.41	11500	0.58	51.08
99	Hardin	88.22	5300	0.27	23.49
100	Pope	86.90	4300	0.22	18.77
101	Pulaski	86.09	8500	0.43	36.77
102	Johnson	79.58	11300	0.57	45.18
	Total Population		1990400	100.00	
	Population-Weighted Mean				98.37

	Non-Normalized	BLS Eqn. County-Based (above)	ACCRA-Based (Table 5)
PMSA	119.59	119.59	120.15*
MSA	103.89	103.89	105.56
NONMETROPOLITAN AREA	98.37	98.37	97.35

*Uses regression equation as explained in footnote b, Table 5. The ACCRA data reports only Schaumburg (COL=124), which is not likely to be representative.


1989 Cost of Living
By County
(Unweighted Average)
Legend
Below 90
90 to 100
100 to 115
Above 115
Kevin Carlock

There are however pros and cons of making adjustments for regional cost differences, especially where the current differences in expenditure per pupil (and loss of pupil equity) are as large as they are in Illinois. Regional cost differences reflect the costs to teachers and administrators of living in each area, as well as other geographical price differences. One way in which such an index would most likely be used, is to convert the "nominal" expenditure per pupil in each district to "real" terms, removing the main effects of regional price differences (that can be done by dividing expenditure per pupil in each district by the index). For example, the $13,600 per pupil spent in Winnetka, when converted to real terms (constant dollars), is approximately $11,889, whereas the $2,500 spent per pupil in a "poor" district, since costs are lower there, converts to about $2,874 in "real terms." If an adjustment for regional cost differences were introduced into the school aid formula, in the ways described above, to adjust all expenditures per pupil to a constant dollar basis, and nothing else were done, then the effect would be to provide more state aid to the higher income districts, and less state aid to the poorest districts. Since there is a considerable problem in Illinois with pupil equity, as dramatically portrayed by the range from the wealthier districts spending $13,600 per pupil, as compared to the poorer districts that are spending $2,000, or $2,500 per pupil, this act alone would just increase the amount of pupil inequity that now exists.

Other compensatory adjustments could be made in the school-aid formula, such as using per capita personal income rather than equalized assessed valuations (EAV) as the means of ability-to-pay of the families in each district, and introducing a much higher state-financed floor or foundation level of expenditure per pupil. Then the adverse effects of adjusting for regional cost differences on the current level of pupil inequity would be counterbalanced.

VII. Conclusions

There are large differences of 57 percent in the cost of living among states and 35 percent between large urban and smaller cities within each state. The basic pattern of differences between higher costs in Eastern Seaboard urban areas, California, Alaska, and Hawaii, and lower costs in Southern and rural areas tends to persist over time. This is largely because the larger urban areas and bedroom suburbs are typified by higher residential land costs, and higher fuel and other housing costs. These are also related to the higher per capita incomes. There may also be some nonmonetary benefits of living in these areas that at least partially justify some of the cost differences. But over time recent changes in the geographical patterns appear to be related to the 1983-89 industrial recovery affecting the northeast, which will likely be moderated by the 1990-91 recession. Lower oil prices later in the '80's affected the south in a different way, and the continuing farm recession holds living costs lower in the midwest farm states. In 1980-85 the industrial states were hurt more severely than the oil producing and western states. But prices appear to have been somewhat inflexible downward there, and these areas also re-covered more quickly than the agricultural states and rural areas, where land and housing prices remain somewhat lower.

Part of the income differences among areas--roughly a third--are purely nominal differences in monetary salaries, given that there are differences in the cost of living. In the absence of a money illusion, employers as well as employees interested in maintaining a parity between services that are purchased or provided in different areas within states or between states must make some kind of adjustment implicitly for differences in the cost of living as well as in nonmonetary amenities. A geographical cost of living index is one step toward making such adjustments somewhat more explicit.

NOTES

[1]Population change and the price of housing may both be endogenous to a limited extent. That is, with respect to population change, persons may be attracted to areas where living costs are lower (e.g., plants locating in Tennessee or the rural south). But the data on migration suggest that this effect is small in relation to the movements towards the sunbelt and to outside the suburbs by more affluent and retired people during the 80s (e.g., to Florida, Arizona, New Mexico, Nevada, and New Hampshire). The ACCRA regressions in Table 4 however suggest that even this effect is insignificant by 1989. With respect to the median price of housing, this is to some extent a function of per capita income (see Hendershott and Thibodeau, 1990). But to treat population change and median house prices as endogenous would require specification of a number of additional factors affecting population change other than the COL, and affecting housing demand other than just Y, going considerably beyond the scope of this paper.

[2]There is no alternative to this BLS method for updating cost of living comparisons over time. These data are routinely used in studies of geographic cost of living variations.

[3]A xerox of the rather large data set that underlies these predictions is available from the author on written request enclosing $5 to cover the cost of processing and mailing. The data for per capita personal income and population change are available for all states. The values of H are the mean of the large city and smaller metropolitan areas that are sampled within each state, maintaining consistency insofar as possible throughout the 1981-90 period (since more areas appear in the data in the later years). For the few states where there are no values of H in the National Realtors Association (1990) data, values from the 1980 Housing Census were used to establish a ratio of housing values to those in an adjacent state for which there are good data. Assuming this ratio to adjacent areas remains unchanged, the values for the missing locations were then estimated.

[4]The results shown use the simple unweighted mean, which would be the index relevant for individuals considering moving. An alternative normalization was done using a mean computed by weighting the COL index for each state by its population. Governments or firms allocating funds in ways that depend on the total population of each area (e.g., school districts) are likely to find the population-weighted mean used for normalization more relevant. The rank order of the COL among states however is unaffected, and the percentage difference in the COL among areas is not significantly affected by use of the population weighted vs. nonweighted mean. Table 3a containing the normalized COL by setting the population weighted mean equal to 100 is available from the author on request.

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Appendix A

Simple Correlations Among the Explanatory Variables

Correlation Matrix: 1981 Statewide BLS-Based Regression:

		Y	ΔP	H	C	P
Per Capita Income	Y	1.00	-.24	.38	.31	.22
5-Yr. Population Change	ΔP		1.00	.22	-.53	.08
Value of Housing	H			1.00	-.47	-.00
Climate (1=Northern)	C				1.00	-.27
Population Level						1.00

Correlation Matrix: 1989 Statewide ACCRA-Based Regression: (n=34)

	Y	ΔP	H	C	P
Y	1.00	.01	.58	.43	.32
ΔP		1.00	.02	-.31	-.07
H			1.00	-.13	.24
C				1.00	-.11
P					1.00

Tests for Change in the Structure

1981 and 1989 Statewide BLS-Based Regressions:

$$F = \frac{(ESS_R - ESS_{UR})/k}{ESS_{UR}/(N+M-2k)} = \frac{(2100-1811)/4}{1811/(22+22-8)} = 1.436$$

$$F < F_{4,36} \ (95\%)$$

Therefore we cannot reject the null hypothesis (i.e., the coefficients are not significantly different; there is no evidence of change in the structure).

1981 MSAs and 1981 Statewide Regressions:

$F = 0.230$ $F_{4,38} = 2.626$ (95% level)

$F < F_{4,38}$, null hypothesis not rejected (i.e., no significant difference in the structure.

1981 BLS-Based and 1989 ACCRA-Based Statewide Regressions

$F = 11.32$, the null hypothesis must be rejected. At least one of the coefficients (undoubtedly the coefficient for ΔP) between the two equations is significantly different.