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Construction of True Cost of Food Indexes From Estimated Engel Curves

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INTRODUCTION

Economists and government agencies have utilized various fixed-weight price indexes to ascertain how changing price levels affect consumers and to adjust the benefit levels of welfare and transfer programs. However, fixed weight indexes, such as the Consumer Price Index (CPI), ignore the fact that consumers will substitute among goods as relative prices change, thereby altering the appropriate true weights. The result is that fixed weight indexes are biased, yet often used, estimators of the cost-of-living.

In order to construct index numbers which are based upon economic theory and to incorporate substitution effects by allowing weights to change from period to period, economists have developed "true indexes" which are typically derived from the estimated parameters of a complete demand system. However, demand systems tend to be limited to several broad categories of goods due to estimation problems, and as such they do not capture the substitution effects that are most likely to occur within the individual categories. Consequently, attempts have been made to find a true index that does not require the estimation of a demand system. One candidate, advanced by Diewert and Fry and Pashardes is the Tornqvist price index which, under specific conditions, is a true index. This index is easy to derive since it simply requires a knowledge of budget shares and prices over the relevant time period. Unfortunately, this index may also fail to capture substitution effects which occur as relative prices change since budget shares tend to be fairly constant over time. This occurs if consumers make quantity adjustments as relative prices change but leave the expenditure levels almost constant after adjusting for inflation.

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The purpose of this paper is to derive true cost-of-food indexes for various demographic groups in the United States from estimated piglog Engel curves. In addition, we wish to determine if the CPI for total food over or under estimates the cost-of-food for any demographic group. The indexes which we construct are based upon the premise that it is possible to capture substitution effects by estimating Engel curves in which the intercepts are allowed to shift from one time period to another. These true indexes are closely related to the Tornqvist index, but use the estimated intercepts from the Engel curves rather than observed budget shares as weights.

This paper is organized as follows. The next section outlines the estimation of a true cost-of-living index from piglog Engel curves. The third section discusses how demographic variables are entered into the model. And the fourth section presents the estimated Engel curves and several true cost-of-food indexes for various demographic profiles.

ESTIMATING THE TRUE COST INDEX OF THE PIGLOG MODEL

Piglog models represent a specific class of preferences which were shown by Muellbauer (1975,1976) to permit exact aggregation over consumers. That is, the piglog functional forms represent market demands as if they were the outcome of a representative consumer. These preferences are represented by a cost or expenditure function which defines the minimum expenditure necessary to attain a specific utility level at given prices. This cost function can be denoted as c(u,p) for utility level "u" and price vector "p". Thus, we can define the piglog function as:

$$\ln c(u,p) = (1-u) \ln a(p) + u \ln b(p)$$

were u lies between 0 (subsistence) and 1 (bliss) so that the positive linearly homogeneous functions a(p) and b(p) can be regarded as the costs of subsistence and bliss respectively. Specific functional forms are assigned to a(p) and b(p) so that their first and second order derivatives can approximate any arbitrary cost function.

Within the context of the piglog model the true cost index for any household may be written as:

$$\ln P(p_1, p_0, ; u_{hR}) = [a(p_1) - a(p_0)] + [b(p_1) - b(p_0)]\ u_{hR},$$

for price vectors p_1 and p_0 and reference utility u_{hR}. Again, this can be interpreted as the cost-of-living at some minimum level of consumer expenditure, say, $\ln S_t = a(p_1) - a(p_0)$ and a marginal expenditure index, $\ln M_t = [b(p_1) - b(p_0)]u_{hR}$. Fry and Pashardes note that over time, $\ln S_t$ should incorporate the effects of substitution among goods, while differences in $\ln M_t$ across households should reflect the distributional effects of inflation.

Utilizing the indirect utility function, the Marshallian budget shares of the piglog model can be derived from the above cost function as:

$$w_{iht} = a_i(p_t) + [b_i(p_t)/b(p_t)]\ [\ln x_{ht} - a(p_t)].$$

This complete demand system could be estimated, but one would be constrained in the number of commodities or groups that could be considered. In general, a high degree of aggregation results in little substitution occurring between the groups since most of the substitution occurs within the separate groupings. However, Fry and Pashardes propose modelling the substitution effects as shifts in the a(p) part of the piglog cost function over time.

Specifically, when the piglog cost function takes the Almost Ideal Demand System form, we can write the Engel curve as:

$w_{iht} = A_{it} + B_i\ [\ln x_{ht} - \alpha_t]$,

where $A_{it} = A_{i0} + \Sigma_j \lambda_{ij} \ln(p_{jt}/p_{j0})$, $t = 0 \ldots T$, and where α_t is equal to the household with the minimum expenditure. The A_{it} terms thus reflect the substitution effects as prices change from p_{i0}. Engel curves can then be estimated for a large number of commodities.

The estimated parameters of the above Engel curves are then used to construct a base period referenced index series for any given household h:

$$\ln I_{ht} = \Sigma_i A_{i0} \ln(p_{it}/p_{i0}) + \Sigma_i A_{it} \ln(p_{it}/p_{i0}) + [\Pi_i p_{it}^{Bi} - 1]\ [\ln x_{ht} - \alpha_t].$$

The average of the first two indexes is the "reference household's" (minimum expenditure) true cost index. All other indexes are relative to the reference household's index, and differ by the effect of their level of expenditure, which is the third term of the above index (marginal expenditure index).

Note, that the Tornqvist index is formally defined as:

$$.5(w_{ih1} + w_{ih0}) \ln(p_{i1}/p_{i0}),$$

where w_{iht} is the budget share for the i^{th} good for the h^{th} household in period $t = 0,1$. However, instead of observed budget shares, we substitute the estimated intercept terms from the piglog Engel curves. These estimated intercepts represent the budget shares of the "reference household" and capture the substitution effects that occur as prices change from a base period. In addition, by utilizing the marginal expenditure index we can derive indexes for households with expenditures above that of the reference household.

The Tornqvist index has been shown to be a true cost-of-living index if the underlying cost function is translog (Diewert) or quadratic (Fry and

Pashardes). Since Engel curves related to the Almost Ideal Demand System have an underlying quadratic cost function, the indexes which we derive can be considered true indexes.

INCORPORATING DEMOGRAPHICS INTO THE MODEL

Household characteristics are important in the way they affect patterns of demand and result in price changes having a varying effect on the cost-of-living for different households. For illustrative purposes assume that there is just one household characteristic, say z, which is a continuous variable. Hence, the cost function may be written as:

$$\ln c(u_h, p, z_h) = a(p) + b(p)u_h + d(p) \ln z_h,$$

where a(p) and b(p) have been defined above and $d(p) = \epsilon + \Sigma_i \zeta_i \ln p_{it}$.

Again, we can let the intercept shift for each time period, thereby capturing the substitution effects, and estimate the Engel curves:

$$w_{iht} = A_{it} + B_{it}(\ln x_{th} - \alpha_t - \eta \ln z_h) + \zeta_i \ln z_h,$$

where η is the equivalent income scale at base period prices (Fry and Pashardes). Our strategy was to organize the data by the "z" demographic variable, so that the $\eta \ln z_h$ term could be absorbed into the definition of the minimum household expenditure, α_t.

Note, that with the data arranged by the demographic variable, traditional zero-one dummy variables can be entered into the equation to account for various types of non-continuous demographic effects such as race and region for both the intercept and the slope parameters. In this study we capture demographic effects for race, region, and household size.

EMPIRICAL RESULTS

We constructed true cost-of-food indexes from Engel curves estimated from data taken from the Continuing Consumer Expenditure Survey (CCES) for the years 1980 through 1985. The CCES is comprised of two components, each with its own questionaire and sample. The first is an interview panel survey in which each of approximately 5,000 households are surveyed every 3 months over a 1 year period. The second, is a diary survey of approximately the same sample size in which households keep an expenditure diary survey for two consecutive 1 week periods. This latter survey obtains data on small, frequently purchased items that are normally difficult to recall, including food and beverages.

By using this survey we were able to look at sixteen food categories which included beef, cereal and bakery products, dairy products, eggs, food-away-from-home, fresh fruit, fish, fats and oils, fresh vegetables, nonalcoholic beverages, other meats, pork, processed fruit, processed vegetables, poultry, and sugar and sweeteners. The equation we estimate for each of the 16 food groups is:

$$W_{iht} = A_{it} + A_{inc}D_{nc} + A_{is}D_s + A_{iw}D_w + A_{ir}D_r + Z_{iz} \ln z_h$$
$$+ Y_{it} + Y_{inc}D_{nc} + Y_{is}D_s + Y_{iw}D_w + Y_{ir}D_r (\ln x_{ht} - \alpha_t),$$

where t = 1980...1985 and the A and Y subscripted variables are dummy shifters for the intercept, A_{it}, and slope, Y_{it}, respectively, for the northcentral, south, west, and race. In addition, we have the intercept shift parameter for household size, Z_{iz}. For this variable z_h is the log of the family size equivalent scales implicit in the official poverty thresholds published by the Bureau of the Census. Ln X_{ht} is logged household expenditure on total food. Finally, α_t is the log of minimum household expenditure on total food for the appropriate demographic group.

The estimates for the 16 Engel curves are presented in table 1. For each equation, A_{80} through A_{85} represents the intercept for the northeast for each year of data. A_{nc} through A_w represents regional dummy variables for the northcentral, south, and west. Z is the estimated coefficient for household size, and A_r is the demographic dummy variable for race.

Slope expenditure parameters are represented by Y through Y_r, where Y represents the estimated expenditure coefficient for nonwhites in the northeast, and Y_{nc}, Y_s, and Y_w, are the estimated dummy slope shifters for expenditures by nonwhites in the northcentral, south, and west, respectively. Y_r is the dummy expenditure slope shifter for whites. R^2 is a statistic for the goodness of fit of each equation, and "F" is a significance test between estimating an intercept for each year versus one common intercept for all years. Many of the estimated coefficients are highly significant.

Variation in the intercepts is a necessary condition for the presence of substitution effects and the F-tests indicate that most equations are better represented by allowing the intercept to shift from one period to another versus a single estimated parameter. Exceptions include fresh fruit, fish, processed vegetables, and sugar and sweeteners. We hypothesize that very little substitution occurs between these four categories and the others. For instance, households may substitute one kind of fruit for another, but may not substitute fresh vegetables for fresh fruit.

As noted above, true cost indexes for reference households can be calculated from the estimated intercepts of the Engel curves. Marginal "demographic" indexes, calculated from the coefficients that shift the intercepts, can be utilized to construct indexes which take into account the effects of race, region, and household size. In turn, marginal "expenditure" indexes, calculated from coefficients which shift the slopes of the Engel curves, can be utilized to construct indexes which take into account expenditures above those of the reference household by race and region.

A true cost-of-food index was constructed for a reference household defined as a nonwhite single household in the northeast and is presented in table 2. In addition, we have indicated how the reference household can be adjusted to account for demographic effects by race, region and household size, as well as marginal expenditure effects by race and region. Over the 1980-1985 period the true cost-of-food for the reference household rose 21.8 percent. Over the time period in question, white reference households have experienced an inflation rate that was greater than the nonwhite reference household. These values ranged from .1 percent higher in 1981 to a high of .7 percent in 1983. Likewise, the three regional marginal indexes are all greater than 100.0, which indicates that the reference household in the northeast experienced the lowest rate of price increase. While both the northcentral and south had similar rates of price increases, the west experienced the highest rates of increase which ranged from .2 percent in 1981 to a high of .9 percent in 1985.

Included in table 2 are the demographic marginal indexes for household size. Each value for household size 2 through 5 is below 100.0 after 1980, and generally decreasing in magnitude over the six years. This indicates that relative to a single household, the true cost-of-food falls as household size increases. Intuitively, this may seem contradictory. However, our 16 food categories include food-away-from-home which experienced one of the largest price increases of all food categories. Our data indicates that per capita food spending declines for this category as household size increases. In 1981 a two person household experienced an inflation rate that was .1 percent lower than a single household, while a 5 person household experienced a rate that was .4 percent lower than a single household. In 1985 the cumulative rates experienced by a 2 and 5 person household were .5 and 1.8 percent lower respectively, than a single household.

Finally, marginal expenditure indexes are also shown in table 2. These marginal indexes are used to construct true cost-of-food indexes for households with expenditures greater than the reference household. They indicate by how much the reference index changes for every one percent increase in total food expenditure. The race variable for white households is again greater than 100.0, indicating that the true cost-of-food index increases as expenditures increase above that of the reference household relative to nonwhites. However, the three regional expenditure indexes are all less than 100.0, which indicates that consumers in the northeast have a larger expenditure elasticity than consumers in the other three regions. All three regions have marginal expenditure indexes that are quite similar, and just slightly less than that of the northeast. Hence, while the northeast should have the lowest value index for the reference household, those northeast households with expenditures greater than the reference household may have true indexes greater than those of the northcentral, south, and west.

With this background we can now look at other cost-of-food indexes constructed from the estimated Engel curves. In table 3 we have constructed indexes for a reference (least expenditure) single household as well as for single households with average and high expenditures. Indexes have been constructed for the total sample (all singles), nonwhites and whites, as well as by region. Average expenditure refers to the average weekly household expenditure in the sample which ranged from approximately $56.87 in 1981 to $67.60 in 1985. The high expenditure level was one standard deviation above the mean values. One standard deviation was approximately $40.00 for each year in the sample.

Looking at table 3 and the least expenditure indexes we see that each individual index is above the CPI. This obviously also holds true for those households with expenditures above the reference household. Other things being equal, we would intuitively expect the true index to lie below the CPI since it allows for substitution to occur among the 16 food categories. However, we note that over the 1980-1985 period households have increased their budget share of food-away-from home. This is also a category which has had a large price increase over the sample period. However, since the CPI is a fixed weight index, and since the weight in the CPI was based upon 1972 expenditures, it underestimates the increase in total food prices. Note also that our indexes in table 3 are for single households, and that our data indicates that these households tend to allocate a larger budget share to food-away-from home than do larger households.

In focusing upon the individual categories we see that whites have a higher index than nonwhites and that the northeast has the lowest index of the four regions while the west has the highest. This was expected from our discussion of the demographic marginal indexes. Note also that for the reference households the differences in the indexes for the races is slight amounting to .1 of a point in 1981 and .2 of a point in 1985. Likewise, differences among regions are quite small, ranging from .2 of a point difference between the northeast and the west in 1981 to .9 of a point between the same two regions in 1985.

When we take into account expenditures above that of the reference household and look at the average expenditure indexes we again see that whites have a higher index than nonwhites, but now the south has the lowest index while the west again has the highest. This is because the south has the lowest expenditure elasticity of the four regions. In general, it appears that the difference in the indexes between the races is greater than between regions. This is not totally unexpected since differences in income received is probably greater between the races than between the regions. Hence, even given the same dollar amount of food expenditures, the buying patterns between the races is different as was shown by the race variable in the estimated Engel curves. While part of this effect is surely due to income disparity, some may be due to cultural differences.

When we move to the high expenditure level in table 3 the same pattern holds that appeared with the average expenditure category, except the differences between the races again widens. Thus, whites have a true cost-of-food index which is .4 of a point higher than nonwhites in 1981, and 1.3 points higher than nonwhites in 1985. Undoubtedly, the difference is due to whites allocating a larger share of their food expenditures to food-away-from home, which itself is probably due to whites having a larger overall income.

In table 4 we have calculated the true cost-of-food index for the same demographic categories as table 3 but for the average sized family with average food expenditures from the sample. In addition, we have calculated indexes for the same categories, but for a family of four. As shown in the table, average family size over the period in question was 2.5 people. Relative to the CPI the true cost-of-food index for the total sample is still greater but closer to it now due to the negative effect of household size. Hence, the true cost index is .3 of a point higher than the CPI in 1981 and 1.4 points higher in 1985. However, when we look at the index from the point of view of race we see that the index for nonwhites is much closer to the CPI. The indexes are the same in 1981 and differ by .5 of a point in 1985. Across regions all the true indexes are above the CPI; again the west has the largest true cost-of-food index as before.

When household size is increased to 4 people the same pattern is found except that now the calculated index for nonwhites is below that of the CPI. However, the index for the total sample is very close to the CPI, being .2 of a point higher in 1981 and .5 of a point higher in 1985. The largest difference occurs in 1984 when the true index is .9 of a point higher that the CPI. The regional patterns are the same as before.

CONCLUSIONS

We have applied a technique whereby true cost-of-food indexes can be derived from the estimation of a simple system of Engel curves. This method allows the researcher to construct indexes for various demographic groups in society. In general, we have seen that the CPI underestimated the cost of food over the 1980-1985 period. It appears that the CPI more accurately reflects the cost of food for nonwhite households with low or average food expenditures and with 4 or more household members.

Conversely, the CPI seems to underestimate food costs the most for small white households with average or above food expenditures. However, we note that most of the true cost-of-food indexes which we calculated were close to the CPI for total food. In this sense, the CPI was a fairly good indicator of total food costs for the above groups over the study period.

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Table 1--Parameter Estimates of Engel Curves

Commodity	A80	A81	A82	A83	A84	A85	A_{nc}	A_s	A_w	Z	A_r	Y	Y_{nc}	Y_s	Y_w	Y_r	R^2	F
Beef	.0748 (.003)	.0722 (.003)	.0657 (.003)	.0645 (.003)	.0610 (.003)	.0541 (.003)	-.0084 (.002)	-.0053 (.002)	-.0076 (.002)	.0472 (.002)	-.0080 (.002)	.0119 (.002)	.0052 (.002)	.0035 (.002)	-.0031 (.002)	-.0054 (.001)	.44	26.23***
Cereals & Bakery	.1199 (.002)	.1225 (.003)	.1224 (.003)	.1217 (.003)	.1233 (.003)	.1272 (.003)	-.0021 (.002)	-.0129 (.002)	-.0201 (.002)	.0184 (.002)	-.0018 (.002)	-.0315 (.002)	-.0074 (.002)	-.0020 (.002)	.0069 (.002)	.0085 (.001)	.66	17.60***
Dairy	.0888 (.003)	.0905 (.003)	.0882 (.003)	.0889 (.003)	.0839 (.003)	.0869 (.003)	.0023 (.002)	-.0089 (.002)	-.0046 (.002)	.0188 (.002)	.0401 (.002)	-.0263 (.002)	-.0076 (.002)	.0025 (.002)	.0064 (.002)	-.0107 (.002)	.63	2.87**
Eggs	.0228 (.001)	.0230 (.001)	.0221 (.001)	.0216 (.001)	.0214 (.001)	.0191 (.001)	-.0004 (.001)	-.0009 (.001)	.0007 (.001)	.0004 (.001)	-.0025 (.001)	-.0047 (.001)	-.0020 (.001)	.0009 (.001)	-.0015 (.001)	-.0010 (.001)	.30	11.25***
Food-Away-From-Home	.2524 (.009)	.2495 (.009)	.2622 (.009)	.2667 (.008)	.2757 (.008)	.2763 (.008)	.0353 (.007)	.0563 (.007)	.0637 (.008)	-.1140 (.006)	.0226 (.006)	.0608 (.007)	.0085 (.007)	-.0060 (.007)	-.0062 (.007)	.0227 (.006)	.66	6.62***
Fresh Fruit	.0414 (.002)	.0422 (.002)	.0447 (.002)	.0428 (.002)	.0429 (.002)	.0422 (.002)	-.0029 (.001)	-.0024 (.001)	.0072 (.001)	-.0111 (.001)	-.0011 (.001)	-.0014 (.001)	-.0005 (.001)	-.0022 (.001)	-.0059 (.001)	-.0025 (.001)	.36	1.71
Fish	.0330 (.001)	.0326 (.001)	.0327 (.001)	.0326 (.001)	.0323 (.001)	.0338 (.001)	-.0073 (.001)	-.0049 (.001)	-.0042 (.001)	.0017 (.001)	-.0135 (.001)	.0064 (.001)	-.0014 (.001)	.0008 (.001)	.0005 (.001)	-.0024 (.001)	.21	.54
Fats and Oils	.0237 (.001)	.2336 (.001)	.0221 (.001)	.0206 (.001)	.0217 (.001)	.0225 (.001)	.0007 (.009)	-.0008 (.001)	.0022 (.001)	.0040 (.008)	.0037 (.008)	.0010 (.001)	-.0010 (.001)	-.0011 (.001)	-.0033 (.001)	-.0027 (.001)	.38	4.34***
Fresh Vegetables	.0392 (.002)	.0430 (.001)	.0435 (.001)	.0438 (.001)	.0437 (.001)	.0427 (.001)	-.0027 (.001)	-.0013 (.001)	.0082 (.001)	-.0047 (.001)	-.0066 (.001)	.0010 (.001)	-.0015 (.001)	-.0013 (.001)	-.0064 (.001)	-.0001 (.001)	.43	5.00***
Non-Alcoholic Beverage	.0732 (.003)	.0679 (.003)	.0678 (.002)	.0709 (.002)	.0714 (.002)	.0721 (.002)	-.0054 (.002)	-.0056 (.002)	-.0091 (.002)	.0018 (.002)	.0145 (.002)	-.0183 (.002)	.0080 (.002)	.0081 (.002)	.0081 (.002)	-.0026 (.001)	.48	3.16***
Other Meats	.0345 (.002)	.0364 (.002)	.0360 (.002)	.0351 (.001)	.0332 (.001)	.0341 (.002)	-.0032 (.001)	-.0094 (.001)	-.0134 (.001)	.0124 (.001)	-.0015 (.001)	.0006 (.001)	.0009 (.001)	.0002 (.001)	.0013 (.001)	-.0027 (.001)	.33	2.79**
Pork	.0498 (.002)	.0518 (.002)	.0478 (.002)	.0464 (.002)	.0447 (.002)	.0450 (.002)	.0058 (.002)	.0064 (.002)	-.0035 (.002)	.0207 (.002)	-.0174 (.001)	.0109 (.002)	-.0015 (.002)	-.0054 (.002)	-.0028 (.002)	-.0065 (.001)	.35	6.95***
Processed Fruit	.0405 (.001)	.0414 (.001)	.0419 (.001)	.0424 (.001)	.0413 (.001)	.0433 (.001)	-.0061 (.001)	-.0075 (.001)	-.0058 (.001)	-.0055 (.001)	-.0048 (.001)	-.0049 (.001)	.0012 (.001)	.0027 (.001)	.0023 (.001)	.0003 (.001)	.34	1.88*
Poultry	.0558 (.002)	.0551 (.002)	.0051 (.002)	.0530 (.001)	.0553 (.002)	.0530 (.002)	-.0092 (.001)	-.0040 (.001)	-.0102 (.001)	.0063 (.001)	-.0215 (.001)	-.0019 (.001)	-.0003 (.001)	-.0005 (.001)	.0012 (.001)	.0008 (.001)	.31	2.19*
Processed Vegetables	.0218 (.001)	.0222 (.001)	.0222 (.001)	.0226 (.001)	.0228 (.001)	.0216 (.001)	-.0016 (.001)	-.0003 (.001)	-.0027 (.001)	.0045 (.001)	-.0029 (.001)	-.0033 (.001)	.0020 (.001)	.0021 (.001)	.0012 (.001)	.0022 (.001)	.32	.85
Sugar and Sweeteners	.0284 (.002)	.0264 (.002)	.0254 (.002)	.0263 (.002)	.0253 (.002)	.0262 (.002)	.0041 (.001)	.0015 (.001)	-.0008 (.001)	.0038 (.001)	.0006 (.001)	-.0033 (.001)	-.0025 (.001)	-.0022 (.001)	.0012 (.001)	.004 (.001)	.28	1.70

*** = Significant at .01
** = Significant at .05
* = Significant at .10

Table 2--

Year	Reference Index	Marginal Demographic Race	Marginal Demographic Region N.C.	Marginal Demographic Region S.	Marginal Demographic Region W.	Household Size 2	Household Size 3	Household Size 4	Household Size 5	Marginal Expenditure Race	Marginal Expenditure Region N.C.	Marginal Expenditure Region S.	Marginal Expenditure Region W.
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.9	100.1	100.1	100.1	100.2	99.9	99.8	99.7	99.6	100.0	99.9	99.9	99.9
1982	112.0	100.5	100.3	100.3	100.4	99.8	99.7	99.5	99.4	100.1	99.9	99.8	99.9
1983	114.2	100.7	100.4	100.5	100.6	99.7	99.5	99.1	98.9	100.3	99.9	99.8	99.9
1984	119.0	100.5	100.5	100.4	100.7	99.7	99.3	99.0	98.7	100.3	99.9	99.8	99.8
1985	121.8	100.2	100.4	100.7	100.9	99.5	99.1	98.6	98.2	100.4	99.9	99.7	99.8

Table 3. Single Household Indexes

Year	CPI	All	Nonwhite	White	NE	NC	S	W
				Single Reference Household				
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.8	108.2	108.1	108.2	108.1	108.2	108.2	108.3
1982	112.2	112.8	112.3	112.8	112.5	112.8	112.8	112.9
1983	114.5	115.3	114.9	115.4	114.9	115.3	115.4	115.5
1984	118.9	120.0	119.5	120.1	119.6	130.1	120.0	120.4
1985	121.7	122.5	122.3	122.5	121.8	122.2	122.6	123.2
				Single Average Expenditure Household				
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.8	108.3	108.0	108.4	108.3	108.3	108.2	108.4
1982	112.2	113.4	112.7	113.5	113.3	113.5	113.2	113.5
1983	114.5	116.3	115.1	116.4	116.1	116.4	116.1	116.5
1984	118.9	121.0	119.8	121.2	120.9	121.2	120.8	121.2
1985	121.7	124.0	123.0	124.1	123.6	123.4	123.7	124.6
				Single High Expenditure Household				
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.8	108.3	108.0	108.4	108.4	108.3	108.2	108.4
1982	112.2	113.6	112.8	113.6	113.5	113.7	113.3	113.6
1983	114.5	116.5	115.3	116.7	116.4	116.6	116.3	116.7
1984	118.9	121.3	119.9	121.4	121.2	121.4	121.0	121.4
1985	121.7	124.4	123.2	124.5	124.0	124.3	124.0	125.0

NE = Northeast
NC = Northcentral
S = South
W = West

Table 4. Comparison of CPI and the True Cost of Food For the Average Sized Household and Households of Four People.

	CPI	All	Nonwhite	White	NE	NC	S	W
	Household Size = 2.5							
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.8	108.1	107.8	108.2	108.1	108.1	108.0	108.2
1982	112.2	113.1	112.4	113.2	113.0	113.2	112.9	113.2
1983	114.5	115.8	114.6	116.0	115.6	115.9	115.6	116.0
1984	118.9	120.4	119.2	120.6	120.2	120.6	120.2	120.5
1985	121.7	123.1	122.2	123.2	122.7	123.0	122.9	123.7
	Household Size = 4							
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	107.8	108.0	107.7	108.1	108.0	108.0	107.9	108.1
1982	112.2	112.8	112.1	112.9	112.7	112.9	112.6	112.9
1983	114.5	115.3	114.1	115.5	115.1	115.4	115.1	115.5
1984	118.9	119.8	118.6	120.0	119.8	120.0	119.8	119.9
1985	121.7	122.2	121.3	122.3	121.8	122.1	122.0	122.8

NE = Northeast
NC = Northcentral
S = South
W = West