**Statement before the House Subcommittee on Human Resources,
Committee on Government Reform and Oversight**

**Hearing on:
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I appreciate the opportunity to discuss CPI measurement issues. An accurate CPI is important. The subcommittee performs a valuable service by focussing attention on issues that are at once technically difficult even for professional economists and of vital concern for users of the index, including those in both public and private sectors. I have worked on CPI measurement issues as a researcher, and in my former capacities as Chief of the Price Index Research Division and Associate Commissioner for Research and Evaluation, both in the Bureau of Labor Statistics, and as Chief Economist in the Bureau of Economic Analysis.

January, 1998 CPI Weight Updating

In January, the Bureau of Labor Statistics (BLS) updated the Consumer Price Index (CPI) weights. They are now derived from consumption patterns for 1993-95. That clearly improves the CPI, because the weights are now more nearly current, compared with the pre-January index that used weights for 1982-84.

Moreover, BLS has indicated that in the future weights will be updated more frequently than the ten to twelve year intervals of the past. Again, that is a positive step that will improve the CPI.

More could be done to reduce weighting effects, often called "substitution bias," in the CPI. Although the average substitution bias has not been large in the past (about 0.15 percentage points annually), in some years it has gone as high as half a point (0.5). CPI changes to minimize bias from out-of-date weights, discussed in the following paragraphs, may be worth their additional cost.

BLS uses a fixed-basket formula (known as the Laspeyres formula) to aggregate 211 "strata indexes," such as the price index for "bananas" and the price index for "computer software and accessories," into the overall CPI. The fixed-basket formula takes no account of consumer substitution--consumers shift spending toward those commodities that become relatively cheaper (whose prices either fall, or rise less than average) and away from commodities whose prices rise more rapidly. A price index formula that allows for consumer substitution provides a better measure of the change in the cost of attaining a constant standard of living. Such a measure is known as a "cost-of-living index."

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[1] The views expressed are solely my own and not necessarily those of the trustees, officers and staff of the Brookings Institution.

The Boskin Commission defined “upper level substitution bias” as the difference between the Laspeyres formula and a formula that estimates a cost-of-living index. It estimated upper level substitution bias at 0.15 percentage points, annually. I concur with this estimate, which is based entirely on empirical work conducted by BLS staff (when I was at BLS from 1971 to 1985, I directed the early BLS research on substitution bias).

As the Boskin Commission noted, upper level substitution bias could be eliminated by using a "superlative" index number formula for the CPI. The Fisher index now used by the Bureau of Economic Analysis to measure Personal Consumption Expenditures (and consumption prices) in the national accounts is an example of a superlative index.

Even with the CPI's traditional Laspeyres formula, substitution bias would be minimized if weights were updated frequently, and were kept current. Though the Laspeyres formula will always be subject to *some* substitution bias, when the weight year is very close to the current year, the bias will normally be small.

The new, updated CPI weights are a positive step that improves the CPI. However, the weights are already roughly four years out of date (the mid-point of the new weighting period is 1994). Even if the CPI weighting cycle is cut in half in the future, so weights are replaced every five years, by 2003 the weights will be approximately nine years old. In today’s heightened concern for CPI accuracy, nine year old weights may be unacceptable. Few other countries tolerate CPI weights that grow so old before replacement. For example, in the new “harmonized” CPI for Europe, the maximum age for any country’s weights is seven years, and the average weight age across European countries will be less.

As an additional consideration, upper level substitution bias may not always remain small. If shocks such as the oil and energy shocks of the 1970's occur, resulting in substantial changes in consumption patterns, substitution bias might be larger in the future than in the past. If it takes several years to get new weights into the CPI, an unanticipated shock might distort the CPI for an unacceptably long period. A regular program for introducing up-dated CPI weights that are as current as possible would avoid potential deterioration in the quality of the CPI caused by unforeseen events.

Further reduction of weighting effects in the CPI could be accomplished by improving the Consumer Expenditure Survey so that the CPI would have: (1) annual weights (a single year, not three years' average, as now, or two years' average, as BLS has proposed), (2) weights that are introduced not only more frequently but also more expeditiously (so they would be more up to date), and (3) weights that are more accurate than those in the present index. What matters is not just the frequency of re-weighting. The currency and the accuracy of the weights matter as well. Improving the currency and accuracy of CPI weights requires improving the Consumer Expenditure Survey.

The Consumer Expenditure Survey

The Consumer Expenditure Survey provides weights for the CPI. At present, it is too small (approximately 5000 "consumer units" or households) to obtain CPI weights from one year's data, so three years' data (1993-95) are used to determine the weights. This three-year averaging process necessarily delays the availability of CPI weights and retards their introduction into the index.

BLS proposes to increase the size of the Consumer Expenditure Survey from its present approximately 5000 consumer units to approximately 7500 units. The intention, as I understand it, is to average two years' consumption data (instead of three years, as now) to obtain the same level of reliability or accuracy in CPI weights. The change is in the right direction, and deserves support. But the survey ought to be larger than 7500 households, because it ought to be large enough to permit CPI weights to be calculated from a single year's expenditure data.

The ideal for a Laspeyres index would have the 1998 CPI weighted by consumer expenditure for 1997. That may not be practical, because of processing time for the expenditure survey data and the time required for analyzing the expenditure data before CPI weights can be estimated. But if the Consumer Expenditure Survey were expanded so it became large enough to use a single year's survey data for CPI weights, it ought to be possible to cut a year and possibly more from the present lag between the weighting period and the date at which new weights are introduced into the index. It would also then be possible to re-weight the CPI annually, which would keep the weights current and minimize upper level substitution bias.

Expansion of the Consumer Expenditure Survey ought also to aim for increased accuracy of the CPI weights (not just maintaining the present accuracy). In a paper published in the St. Louis Federal Reserve Bank *Review*, I pointed out, as have others, that the Consumer Expenditure Survey does not give compatible results--either in levels or in trends--to the Personal Consumption Expenditures component of the national accounts. This is true for major consumption components like motor vehicle purchases and food at home. When the two data sources on consumption expenditures disagree, that does not necessarily imply that the national accounts consumption data are always right and the Consumer Expenditure Survey information is always wrong. Nevertheless, it does raise questions about the accuracy of CPI weights. Analysts of consumption data, including policy analysts in the Executive branch and in Congressional agencies, have long felt that the Consumer Expenditure Survey data need attention. A conference involving BLS staff and users of Consumer Expenditure Survey data will take place in May. A comprehensive review of the Consumer Expenditure Survey data and methodology deserves high priority, and the review should consider both CPI weighting uses of the survey and the other uses for consumer expenditure data, particularly research and policy analysis uses.

The Boskin Commission did not emphasize the accuracy of Consumer Expenditure Survey data in its review of the CPI, or propose additional expansion of the survey. It is hard to understand how the CPI can be accurate without accurate weights. And the U.S. Consumer Expenditure Survey

is small by international standards. Canada, for example, includes about 36,000 households in its consumer expenditure survey (though the data collected in the Canadian survey are not as detailed in some cases as in the U.S.)

Even estimates of substitution bias require accurate weights. Substitution bias is often estimated by comparing the Laspeyres index formula used in the CPI with the results of another formula, such as the Fisher index. The Fisher index uses weights for two periods, rather than one. An accurate measure of the *true* difference between Fisher and Laspeyres indexes requires accurate weights for both indexes. When weights are inaccurate, the difference between Fisher and Laspeyres indexes may just measure statistical "noise."

The BLS Change to the Geometric Mean for Lower Level (Item Strata) Indexes

BLS recently announced that the statistical estimator used for most lower level indexes, or item strata indexes, will be changed to a geometric mean estimator in January, 1999. Examples of item strata indexes are "bananas," "sugar and artificial sweeteners," and "college tuition and fees." The change to the geometric mean was recommended by the Boskin Commission.

I support the change to a geometric mean as an interim step to improve the accuracy of the CPI. However, I believe that this issue needs more research and might need to be revisited in the future.

Almost all of our knowledge about the lower level index number problem in the U.S. CPI comes from research by BLS staff, who were seeking to improve the index. Outside reviews, including the Boskin Commission, have added mostly interpretations of the BLS research. But some aspects of the interpretation are still in doubt.

What we know at this stage is that the old BLS estimator for strata indexes (sometimes called an "arithmetic mean") is seriously flawed, and that the geometric mean gives a different answer. The size of the difference between arithmetic and geometric mean estimators depends on the year for which the difference is estimated, and on the exact comparison that is made, but it is somewhere in the neighborhood of 0.2 percentage points per year.

The Boskin Commission labeled the difference between arithmetic and geometric mean estimators "lower level substitution bias." In my opinion, "lower level substitution bias" is part of the interpretation of the research findings, but it is an interpretation that is incomplete. The geometric and arithmetic mean estimators for the price index for bananas, for example, are different, but there is no consumer substitution among different kinds of bananas because bananas in the United States are as close to a homogeneous commodity as can be found. We need more research on how consumer shopping, search, response to store sales, and so forth should be handled in a cost-of-living index. I have recently written on this, as has Prof. Robert Pollak, of Washington University. The lower level substitution bias interpretation of BLS research emphasized by the Boskin Commission is not wrong, but it is not a complete interpretation.

Having said this, I emphasize that I support the BLS move to geometric means as an interim improvement to the CPI. It is an interim step because the "lower level" index number problem is one that has emerged only recently and the issues are still not fully understood. In contrast, the "upper level" substitution problem is one where theoretical and empirical economic research has a long history and the issues are well settled,

Other Points on Substitution Bias

Other options for moving the CPI weighting closer to a cost-of-living index have been discussed. One is to change the index from its traditional Laspeyres formula to a superlative formula, such as the Fisher index. Superlative formulas require weights for the current year (for example, a measure of price change for 1997-98 would require weights for both 1997 and 1998), but current year weights are not available until after the publication month. Superlative index number formulas could only be used in the CPI if the index were routinely revised, retrospectively, as the new information becomes available.

Revisions to economic time series are never liked, no matter what series is revised, and the CPI has no tradition of revision. Yet, there is no particular reason why we tolerate revisions to national accounts when the revisions improve the accuracy of the information and do not tolerate them in the CPI. Many escalation arrangements that use national accounts information exist in the United States, and users have evolved methods for escalation with indexes that are revised. Accordingly, the escalation uses of the CPI do not seem an overwhelming reason to reject revisions, provided assistance is provided to users who may be unfamiliar with escalation contracts where the escalating index is revised.

Another proposal is to estimate or forecast the change in a superlative index number, using Consumer Expenditure Survey information and some form of weighted geometric mean index at the upper level. That is, one could combine the 211 strata of the CPI (most of which will be computed from geometric means, after 1999) with an expenditure-weighted geometric mean index. The intention, here, is to reduce the difference between the Laspeyres formula and the superlative formula, thereby reducing potential CPI revisions (from the first option discussed above) and/or surmount the problem that current-period expenditure data are not available to compute the superlative index.

Both these proposals deserve consideration. Whether or not the official CPI is converted to a superlative index on a current basis, an alternative or research superlative index should be published as an analytic aid in evaluating the official index.

However, these proposals imply that CPI weighting information is available on a more current basis than is presently the case. The proposals, in other words, require an expanded and improved Consumer Expenditure Survey, so that weights could be incorporated on a timely basis. If the expenditure survey were improved, as suggested in the section on the expenditure survey, above, it is likely that a frequently re-weighted Laspeyres index would also have very low substitution

bias (this seems likely from evaluation of alternative index number formulas for the Personal Consumption Expenditures component of the national accounts). Thus, improvements in the Consumer Expenditure Survey are necessary to implement effectively any option for reducing CPI weighting effects and substitution bias.

BLS Research

Congressman Shays' letter asked for suggestions for how Congress and the Administration could work to improve the index. In responding to this very positive request, I emphasize that researchers inside the BLS have developed most of the information that is now available on upper level substitution bias and on the lower level index problem. Without the very active and very professional research staff that exists inside BLS, economists would lack firm knowledge of the sizes of potential biases in past CPI's and what to do about them. I recall that when BLS economists first began work on estimating substitution bias in the CPI, more than twenty years ago, many economists were willing to "guesstimate" that the CPI substitution bias amounted to 2 to 3 percentage points per year. That we now have numbers, rather than guesstimates, facilitates an informed debate on CPI measurement issues, and demonstrates the value of the BLS research program.

BLS researchers have also demonstrated that they can make substantial contributions to better methods for handling quality change in goods and services priced for the CPI. Quality change was, rightly, emphasized by the Boskin Commission as a serious measurement problem in the CPI, and it is recognized as a difficult problem. Improving quality change methods is probably the most pressing need for moving the CPI closer to a measure of the cost of living, and additional research on quality change promises a very great payout for improving the index.

Accordingly, assuring resources for continued research on measurement issues in the BLS is one of the greatest contributions that can be made to long-run improvement of the CPI.

Summary

The BLS has made three recent positive changes that improve the CPI and move it closer to a cost-of-living index.

First, it has updated the weights to a 1993-95 reference period, which means they are more current than the former 1982-84 weights. That should reduce the size of the upper level substitution bias, at least for the next few years.

Second, it has announced that the CPI re-weighting cycle, which has been ten to twelve years in the past, will be shortened in the future. That means that CPI weights will never again become as far out of date as they were before January, 1998, when they were roughly 14 years old.

Third, it has announced that most lower level indexes will be computed in the future by the

geometric mean method. This replaces the old arithmetic mean method for lower level indexes, which has been shown to have serious faults.

Additional reduction of weighting effects, and substitution bias, in the CPI can be accomplished by expanding the Consumer Expenditure Survey, and improving its data. An expanded expenditure survey will permit CPI weights drawn from one year's survey data, instead of the average of three years' data, as now. It will also make it possible to reduce substantially the time it takes to bring new weights into the index, so in the future the weights can be more nearly current than they are at present, where the new weights are already roughly four years out of date.

BLS research has led to most of the knowledge about substitution bias and lower level index number problems in the CPI. Because the payoff to resources devoted to research has been so high, assuring continued resources to the BLS research function is possibly the most valuable step that can be taken to assure future improvements to the CPI.