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*APPLIED ECONOMICS IN ACTION:
THE CPI COMMISSION[†]*

The CPI Commission: Findings and Recommendations

By MICHAEL J. BOSKIN, ELLEN R. DULBERGER, ROBERT J. GORDON, ZVI GRILICHES,
AND DALE W. JORGENSON*

Measuring prices and their rate of change accurately is central to almost every economic issue, from the conduct of monetary policy to measuring economic progress over time and across countries to the cost and structure of indexed spending and taxes. In the first external extensive evaluation of the nation's price statistics since the Stigler Commission in 1961, the CPI Commission (see Boskin et al., 1996) concluded that the change in the Consumer Price Index (CPI) overstates the change in the cost of living by about 1.1 percentage points per year (the range of plausible values is 0.8–1.6 percentage points). That is, if inflation as measured by the percentage change in the CPI is running 3 percent, the true change in the cost of living is about 2 percent. This bias might seem small, but when compounded over time, the implications are enormous. Over a dozen years, the cumulative additional national debt from overindexing the budget would amount to \$1 trillion. The implications of overstating inflation for understanding economic progress are equally dramatic. Instead of falling, average real earnings have risen, and instead of stagnating, real median income

has grown, over the last quarter century. The poverty rate would be smaller. And because the CPI component price indexes are inputs into the national income accounts, real GDP growth is also understated (see the accompanying paper by Boskin and Jorgenson [1997]).

Why is inflation so hard to measure? Despite numerous improvements that have been made historically and continue to be made by government statisticians in all countries, including the U.S. Bureau of Labor Statistics (BLS), many of them laboring under inadequate human and financial resource constraints, it is difficult to keep up with the dynamic change in the economy. New products are being introduced all the time, and existing ones improved, while others leave the market. Relative prices of different goods and services change frequently, for example, in response to technological and other factors affecting costs and quality, which leads consumers to change their buying patterns. There are literally hundreds of thousands of goods and services available in rich industrialized modern market economies. A single supermarket may contain 30,000 differently priced items, and a WalMart store over 40,000. As we have become richer, demand has increasingly shifted to services away from goods, and to characteristics of goods and services such as enhanced quality, more variety, and greater convenience. Technology and entrepreneurship provide them. But all these factors, plus others, mean that a larger fraction of what is produced and consumed in an economy is harder to measure than decades ago, when a larger fraction of economic activity consisted of easier-to-measure items such as tons of steel and bushels of wheat.

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I. Findings

How to obtain information on who is buying what, where, when, why, and how in an economy, and then to aggregate it into one or a few measures of price change raises a host of complex analytical and practical problems. The mathematics of aggregating changes in the prices of different goods and services are complex and subtle (see Irving Fisher, 1922; Erwin Diewert, 1976). Despite decades of analytical and empirical research, some of it recently done in statistical agencies such as the BLS, the statistical agencies around the world still primarily rely on fixed-weight indexes which do not account for consumer substitution among commodities. Thus, these Laspeyres measures of inflation are inherently upper bounds, and empirical studies led the Commission to conclude that this source of substitution bias—failing to catch that consumers substitute chicken for beef when beef prices go up (upper-level substitution bias), or Delicious for Macintosh apples under similar circumstances (lower-level substitution bias)—leads to an overstatement in the U.S. Consumer Price Index of about 0.4 percentage points.¹

Likewise, there has been a fundamental change in the nature of retailing, perhaps most pronounced in the United States, but spreading virtually everywhere with the advent of superstores and discount chains. The same VCR available for \$200 in a local appliance store may be only \$160 at Circuit City. Since price data are collected *within* outlets, the shift of consumers to purchasing from discounters does not show up as a price decline, even though consumers reveal by their purchases that the price decline more than compensates for the potential loss of personal services. Thus, in addition to substitution bias among commodities there is an outlet substitution bias. In the United States, this adds another 0.1 percentage point of upward bias.

¹ A similar bias occurs in most other countries (although Statistics Canada has fixed about half of this problem, and statistical agencies in other countries are working on it).

Another problem is that price data tend to be collected during the week. In the United States, about 1 percent of price quotes are collected on weekends, despite the secular trend of an increasing share of purchases made on weekends and holidays (probably reflecting the increasing prevalence of two-earner couples). Since some outlets emphasize weekend sales, there may be a “when” bias as well as a “what” and a “where” bias. Recent research suggesting that prices rise less rapidly in data collected by scanners rather than price-takers may be partly explained by this phenomenon.

These types of problems account for just a little under half of the 1.1 percentage points identified by our commission. Slightly over half results from the difficulty of adjusting fully for quality change and the introduction of new products. Economists have known since John Hicks (1940) that the introduction of a new product should be dealt with in a cost-of-living index by using its reservation price and including the consumer surplus attributable to the introduction of the product. Noting this, our commission took the more cautious approach of primarily including estimates of explicit dimensions of quality change and the very late introduction of major new products into the index. In the U.S. CPI, VCRs, microwave ovens, and personal computers were included a decade or more after they had penetrated the market and their prices had fallen 80 percent or more. Cellular telephones will not be included in the U.S. CPI until 1998, despite the facts that there are more than 40 million cellular subscribers in the United States today and that well over 100 million Americans receive calls on land-line phones initiated on cellular phones. Jerry Hausman of MIT estimates that the quality-adjusted price of cellular services has declined by 90 percent since 1989. The advent of personal communication services (PCS) competition and deployment of digital technology will have substantially occurred by the time cellular services begin to get priced. Correspondingly, the pace of quality change in some important areas, such as health care and consumer electronics, has been breathtaking, and our statistics are not keeping up.

When economists try to define the change in the cost of living it is to answer the question

TABLE 1—ESTIMATES OF BIASES IN THE CPI-BASED
MEASURE OF THE COST OF LIVING
(PERCENTAGE POINTS PER ANNUM)

Sources of bias	Estimate
Upper-level substitution	0.15
Lower-level substitution	0.25
New products/quality change	0.60
New outlets	0.10
Total (Plausible range)	1.10 (0.80–1.60)

“How much more income will consumers need to be just as well off with the new set of prices as the old?” In addition to the substitution issue raised above, this clearly involves measuring *quality-adjusted* prices. One would not want to count a major improvement in quality that greatly enhances well-being as inflation. Hence, the Commission examined an exhaustive set of 27 subcomponents of the CPI, and based on empirical research findings and common-sense observation, estimated (we believe conservatively) a quality-change and new-product bias in the CPI of 0.6 percentage point per year (see the accompanying paper by Gordon and Griliches [1997]).

Thus, the total bias is estimated at 1.1 percentage points per year, as detailed in Table 1.

II. Recommendations

Our commission made a variety of recommendations that form guideposts for statistical agencies to improve the quality of their statistics. (Many of the world’s statistical agencies, including the BLS in the United States, are planning to make progress on at least some of these fronts already.) These include changing from fixed-weight formulas to mathematical formulas that account for consumer substitution in the aggregation of prices of goods and services. Also important are reweighting the consumption basket more frequently and increasing the pace of sampling so that new products enter more quickly and the prices of new products, the commodity mix, and the outlet mix are adjusted more rapidly, and so that the prices collected are more representa-

tive of current market activity.² Finally, more use should be made of hedonic statistical methods to adjust for quality change.

More specifically, the Commission’s first and overarching recommendation is that the BLS should establish a cost-of-living index as its objective in measuring consumer prices. All of the other specific recommendations are aimed toward achieving this goal. In its publications, the BLS has explicitly recognized that the CPI is not a cost-of-living index for decades. Still, its most common and pervasive use and interpretation is as a cost-of-living index. We believe a more fundamentally sound cost-of-living index can and should be developed. In order to achieve this objective, the Commission recommends the publication of two indexes: one which is published monthly on a timely basis and is designed to maintain the spirit of the cost-of-living index yet accommodate the inconsistent timing schedules of the required information; and a second index which is published and updated annually and revised historically to introduce improvements arising from new information and new research results. The purpose of having two indexes is to accommodate the complex issues that must be addressed and the time delay in obtaining all of the necessary data.

We divided our recommendations into three time horizons. First, short-run recommendations include those we think can be implemented immediately, with little in the way of additional resources or new data-collection initiatives. These center on changing the current CPI computation, primarily to make it more current, and on computing an annually updated and subsequently revised cost-of-living index. Second, the intermediate-run reforms are those that are currently feasible but would require new data collection, reorganization of activities, or changes in the detail of the various subindexes produced by the CPI. And third, longer-run recommendations emphasize topics in areas that need additional research and attention.

² The United States is ahead of most countries in its sampling procedures; some others do not yet sample.

The timely monthly index should continue to be called the CPI and should move toward a cost-of-living concept by adopting a "superlative" index formula for changing market baskets, abandoning the pretense of sustaining the Laspeyres formula. To accommodate the delay in obtaining information on quantities needed to combine the price changes of items in the lowest groupings, the BLS should move away from the assumption that consumers do not respond at all to price changes in close substitutes. Thus, the BLS should move to a "trailing Tornqvist" index (weighted geometric mean of price relatives) at the stratum and entry-level item (ELI) level and also, concurrently, to geometric means of price relatives at the elementary aggregation level. These moves would alleviate the problem of the growing irrelevancy of market baskets based on decade-old consumption patterns, reduce significantly the substitution and formula bias, and facilitate the speedier introduction of new goods and services into the index.

Because of the lag in collecting up-to-date information on consumer spending patterns, the weights will have to be based on a trailing two- or three-year average of past expenditures (e.g., 1993–1994 weights for the 1996 price changes). They should be changed every year. This implies that the BLS should organize itself for "permanent" rather than decadal revisions in the CPI. Both the weights and the priced commodity and services assortment need more frequent updating. Also, wherever possible, scanner data and other "outside" data should be used both to reduce the cost of data collection and (primarily) to expand the assortment of goods and services priced concurrently, to provide current item weights, and to introduce new items as quickly as they enter the market. Whether this will result in a net reduction in the cost of data collection is an open question.

As subsequent data become available, the weights will be updated, and new goods will be introduced, with their history extended backward. The information incorporated in the published CPI should undergo retroactive revision, as far back as the new information warrants, in the form of a new cost-of-living (COL) index, using a compatible

"superlative-index" formula. This "revised" COL index would be published annually, with a lag of a year or two, and would be subject to additional revisions after new information emerges and new methodology is introduced. The published versions of this index need never be "final."

The BLS should study the behavior of the individual components of the index to ascertain which components provide most information on the future longer-term movements in the index and which items have fluctuations that are largely unrelated to the total. The former should be emphasized by the BLS in its data-collection activities. This could result in the down-weighting or even elimination of data collection for certain cities and a revision of the commodity structure of the index. The revised index would consider some goods as having a national market, sampling a larger number of items but with less regard to geography, focusing on geographical differences only for more "local" commodities, such as fuel costs, rent, personal services, and fresh produce.

Currently, the BLS collects a large number of price quotes on bananas, because they are inexpensive to collect and their prices are quite variable, even though these variations are not related systematically to the underlying trend movements in the CPI. At the same time, less attention is paid to commodities that are less variable but more likely to change (disappear or be redesigned) and harder to measure, such as surgical treatments, consumer electronics, and communication services. The BLS should change the CPI sampling procedures to de-emphasize geography, starting first by sampling the universe of commodities to be priced and then deciding, commodity by commodity, what is the most efficient way to collect a representative sample of prices from which outlets, and only later turn to geographically clustered samples for the economy of data collection.

The current city-level price indexes are useless for geographical comparisons of levels and misleading as measures of rates of change, since they are not based on any clearly defined levels. To do an adequate job of describing the geography of price *levels* in the United States

will require the collection of prices for the same commodities and services in different cities. To study differential changes in the price levels across cities, arising from different competitive and population trends, it may prove adequate to sample the "national" commodities in specific cities only once a year or so, on a rotating basis. More generally, one could design a model consisting of an underlying "national" trend level of the CPI, which would be the primary focus of monthly estimation, and more slowly changing city differentials, which would be based on less frequently collected data. This would allow the CPI to concentrate resources on expanding the sample and analysis in rapidly changing areas of the commodity and services spectrum, such as health services, communication services, and food away from home, where quality change and commodity turnover are endemic.

Moving to a notion of a new "basket" each year will allow a faster introduction of new items and new outlets. Moving to a national sample for most such items would allow expansion of the number of specific items (models, varieties, types) sampled within a particular ELI and reduce thereby the number of forced substitutions. Also, this would allow for the use of new sources of data, such as scanner data on prices, and industry-wide information on sales of specific items (for more detailed weights), leading to a quicker identification of new goods and their faster incorporation into the index. This is also the level at which more extensive quality adjustments and "comparable" substitutions could be made, recognizing the appearance of new outlets and new versions of services that provide consumers, effectively, with cheaper sources for the same or similar items consumed previously.

A number of additional specific explicit and implicit recommendations are made in the report, such as creating a more permanent mechanism for bringing outside information, expertise, and research results to the BLS; converting the price of durables, such as cars, to a price of annual services analogous to that for owner-occupied housing; changing the treatment of insurance to an *ex ante* consumer price

rather than an *ex post* profits-based measure; and determining whether collecting more price data on weekends and holidays would make a difference.

Longer-run considerations include examining the ramifications of the assumptions of price equilibrium, developing research programs to look beyond the current "market basket" framework, perhaps eventually to be able to publish supplementary information on non-market issues. The BLS should also develop a number of new data-collection initiatives, in particular, health status surveys to obtain more information on various quality-of-life issues. Most importantly, efforts should be made to gather data on time use from a large sample of consumers in order to deal with search and related issues.

Of the 1.1-percentage-point bias in the United States we have identified, we believe that about 0.4–0.5 percentage points, from the substitution bias, could be dealt with in relatively short order (a year or so) by the statistical agencies. Dealing with quality change and new products will be harder, but use of the appropriate statistical techniques and getting more up-to-date sampling should enable the statistical agencies to get another 0.2–0.3 percentage points over the intermediate run of several years (although exactly for which products, when, is impossible to say). Even with the widespread use of scanner data, it is likely that there will remain an irreducible minimum of quality-change and new-products bias. But the overstatement can be substantially reduced.

The Commission made a variety of recommendations to Congress, such as providing additional resources necessary to expand the Consumer Expenditure Survey sample and the detail collected, to make the Point-of-Purchase Survey (POPS) more frequent, and to acquire additional commodity detail from alternative national sources such as industry surveys and scanner data. Congress should establish a permanent rotating independent committee of experts to review progress in this area every few years, and to provide advice on the appropriate interpretation of the then-current statistics. Congress should also enact legislation necessary for the Department of Commerce and the

Department of Labor to share information in the interests of improving the accuracy and timeliness of economic statistics and to reduce the resources consumed in their development and production. In particular, substantial progress can and should be made in reducing the time from survey collection to implementation in the price program. Other countries appear to be able to do this in less than half the time that it takes in the United States.

III. Concluding Remarks

While the CPI is the best measure currently available, it is not a true cost-of-living index. It suffers from a variety of conceptual and practical problems as the vehicle for measuring changes in the cost of living. Despite important BLS updates and improvements, it is likely that changes in the CPI have substantially overstated the actual rate of price inflation. Moreover, revisions have not been carried out in a way that can provide an internally consistent series on the cost of living over an extended span of time. More importantly, changes in the CPI are likely to continue to overstate the change in the true cost of living for the foreseeable future. This overstatement will have important unintended consequences, including overindexing government outlays and tax brackets and increasing the federal deficit and debt. If the intent of such indexing is to insulate recipients and taxpayers from changes in the cost of living, use of the CPI substantially overcompensates (on average) for changes in the true cost of living.

The analytical and econometric research done over recent decades has heightened economists' understanding of these issues. The time has come for governments in the United States and elsewhere to recognize these problems and act accordingly. That involves providing enhanced support for the statistical agencies to improve the price statistics with all deliberate speed in a nonpoliticized manner. It may well require additional resources. Virtually every major private firm in the world is spending heavily on information technology (hardware, software, and human capital), and

we should not expect better statistics from our government agencies without a corresponding investment.

Finally, the President and Congress must decide whether they wish to continue the widespread overindexing of their government programs. If the purpose of the indexing is to compensate recipients of the indexed programs or taxpayers for changes in the cost of living, no more and no less, they should move to wholly or partly adjust the indexing formulas. Such changes will have profound ramifications for our fiscal futures, but these changes should be made even if the budget were in surplus and there were no long-run entitlement cost problem. They should be made first and foremost in the interest of accuracy, not only for the budget and the programs, but for the economic information upon which citizens depend.

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