The Treatment of Mandated Pollution Control Measures in the CPI

Introduction

In October 1970, the Bureau of Labor Statistics (BLS) made a decision to treat the charges for mandated automobile anti-pollution devices as price increases in the Consumer Price Index (CPI). This decision was predicated on the idea that the individual vehicle purchaser derived the same services from the purchase of the automobile with or without such devices. The theoretical justification for such treatment was based on a paper by Professor Robert A. Pollak entitled “Some Problems in the CPI." A more general treatment of the environment in the cost-of-living index later appeared as a chapter in his book, *The Theory of the Cost-Of-Living Index*, published in 1989. The essential argument was that, while changes in the quality of the environment do affect the cost of living, the theoretically correct treatment is unattainable in the CPI, since we know neither how the quality of the environment should be measured nor how it enters the utility function of the individual consumer.

A decision made by an interagency committee in March 1971 led BLS to reverse its October 1970 decision and to treat anti-pollution devices as quality improvements in the CPI.[1] That reversal was based on two conclusions: (1) these devices should be treated as increases in real output in the national accounts and in the construction of other measures of real output and productivity, and (2) these devices should not be treated differently in the CPI than they are in output statistics. Accordingly, in March 1971, BLS began to factor out the price change associated with mandated anti-pollution devices in the CPI and made this policy retroactive to October 1970.[2]

As part of an effort to explain more precisely how the CPI fits into a cost-of-living framework confined to market goods and services, the BLS has reviewed its treatment of mandated anti-pollution measures. This review particularly focused on whether it was correct to impose a consistency of treatment in the CPI and other price indexes, as

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[1] The agencies represented were the Office of Management and Budget, the Bureau of Economic Analysis, and the Bureau of Labor Statistics.

[2] Previously, the BLS had made small quality adjustments for anti-pollution devices in 1969. These adjustments were not affected by the subsequent policy changes.

indicated in point (2) above. After careful review, the BLS has decided that, beginning in 1999, it will no longer treat modifications to goods and services that are made solely to meet air quality standards as quality improvements in the CPI. Price increases associated with such modifications will be treated as increases in the index. This decision should not be construed as a judgment that the reduction of air pollution from automobiles is without value. The economic rationale for the new treatment is explained below.

Background Concepts

The CPI measures the average change in the prices paid by urban consumers for a fixed market basket of goods and services (*BLS Handbook of Methods*, page 167). The CPI can be thought of as being a subindex of a cost-of-living index; that is, it is defined to include the goods and services purchased by consumers through market transactions[3] and is conditional on non-market factors such as the environment, crime level, and numerous publicly provided goods and services such as highway infrastructure, national defense, and so on.[4] For most publicly provided goods and services there is no explicit price; taxes serve in lieu of prices. Changes in taxes are included in the CPI only when they affect the price paid by consumers for market goods. (Income taxes, for example, are not included in the CPI, but sales taxes are included.) In general, changes in the level and quality of the factors listed above are deemed out of scope for the CPI.

Because there are many issues arising from mandated product changes, it is useful to consider them within the context of a general example, one that does not concern anti-pollution or other environmental mandates. Suppose that the Federal government mandated that the tread design and material used for automobile tires had to be changed in order to reduce the maintenance costs for Interstate highways. Further suppose that this change is costly to implement, thereby raising the price of tires to the vehicle producer, and that there is no effect on tire wear and tear, driving noise or comfort, or other influences on the satisfaction derived from the vehicle by the individual consumer. Under current practice, if vehicle manufacturers consequently raise their price, then the

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[3] The non-market imputation of homeowner's equivalent rent is an exception to the rule that only market transactions are included in the CPI.

[4] In technical terms, the goods included in the CPI are not assumed to be separable from these utility-affecting factors; consumers purchase alarms to compensate for increased crime and purchase air conditioners to overcome air quality problems. Nevertheless, the problem of expanding the CPI to include such factors does not have a ready solution, and so they are taken as a given.

price increase for vehicles would be treated as a price change in the CPI, not an improvement in the quality of vehicles. If the government had imposed a tax on either tires or vehicles to pay for road maintenance, the CPI would record the full price change in the respective product categories.[5]

One might argue that, because tires now have a "road preserving" characteristic, the mandate-induced increase in the price of the vehicles should be adjusted for the value of this characteristic. Yet, inasmuch as "road preservation" applies to a public good, such an adjustment is out of scope for the CPI, as described above.

Finally, if the mandated change in tires altered the quality of the tire by, say, lengthening its expected mileage life, then the tire price would be adjusted to remove from the CPI the estimated value to the consumer of the mileage life change. The difference here is that longer-lasting tires are of direct value to the individual consumers.

The above hypothetical case illustrates the following general principle: Price changes deriving from mandated product changes that affect only public goods (or the other non-market factors listed above) are properly treated in the CPI as pure price changes. If, however, the mandate also entails a change in product characteristics for which consumers would ordinarily pay, then a quality adjustment should be performed for these changes. In some cases—if, for example, the mandated tread change *reduced* the expected tire life—this quality adjustment could be in the negative direction.[6]

In October 1970, BLS applied this principle to the case of anti-pollution mandates for vehicles and determined that any consequent price change should be treated as a pure price change. That determination was subsequently reversed, as described above. In December 1994, anti-pollution mandates were imposed on motor fuels, and the BLS decided to treat these mandates in the same way that vehicle mandates are treated. It is important to note, however, that there are numerous cases in which mandated pollution-

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[5] The CPI program also contains a price index for tires. The above description of the change in the price index would apply to this index as well. Accordingly, to simplify the exposition, the focus will be on the New Vehicle price index.

[6] A more complicated situation arises when the mandated product change induces other product changes that consumers would be willing to pay for. For example, the requirement of catalytic converters on automobiles may have induced the adoption of fuel injection that beneficially altered the performance of engines. In such a case, a quality adjustment would be made for the addition of fuel injection.

control measures have been treated as price increases in the CPI. For example, no quality adjustments have been made in the cases of increased utility prices that arise from the installation of smokestack scrubbers by power generating firms, even though such installations resulted from anti-pollution mandates.

It is within the above context that the BLS has examined whether mandated anti-pollution product changes in vehicles and motor fuels should continue to be exceptions to the rule generally applied in the CPI. As mentioned at the outset, the raising of this issue is not intended to suggest that the reduction of air pollution from vehicles is without benefit. The intent is to point out that measures that affect air quality are not treated consistently within the CPI and that air quality is among a set of public goods whose quality is considered to be out of scope for the CPI. There does not appear to be any compelling reason to treat anti-pollution mandates that enhance air quality differently from product changes that affect the quality of other public goods.

This position raises two broad questions. First, should the scope of the CPI be expanded to include non-market factors? Second, can the CPI treatment of anti-pollution equipment be different from the treatment of such equipment in the Producer Price Index (PPI) and in the export and import price indexes of the BLS's International Price Program (IPP)? Recall that consistency of treatment among price indexes was one of the motivations for the March 1971 reversal of the October 1970 BLS decision to treat the increase in auto prices deriving from anti-pollution equipment mandates as a pure price change.

The Difficulty of Incorporating Non-Market Factors

One might argue that, so long as the BLS maintains that the CPI is grounded in a cost-of-living framework, it ought to include adjustments for the changes in the level and quality of non-market factors such as the environment and public goods. Professor Pollak extensively addressed this argument in the paper cited earlier. There it is maintained that, although it would be theoretically valid to include such adjustments, they cannot in fact be performed because of the absence of measures of the quality of the environment and other public goods and because the role of public goods in the utility of the representative household is unknown.

There are many difficulties in measuring changes in the quality of the environment. Broadly speaking, two related questions must be addressed. First, which of the

influences on air quality should be examined? Second, how should changes in air quality be monetized? Regarding the first, one would want to account for all sources of change in air quality. This means, for example, that an accounting would be required for the effects of changes in climatic conditions, changes in population, changes in individual or corporate behavior (e.g., the use of bicycles and public transportation in place of cars, or the use of coal in place of nuclear power), and the interaction between different sources of change in air quality. For example, anti-pollution mandates may positively influence air quality, but the magnitude of the benefit must be balanced by other factors induced by the mandate—if the measures reduce gas mileage, then the impact of the increased amount of gasoline burned for a given number of miles must be included. Generally, as Professor Pollak pointed out, the inclusion of quality adjustment for non-market goods must be on a symmetric, all-or-nothing basis, unless any exclusion can be set within a conceptual framework. Otherwise, any exclusion would be *ad hoc* and potentially would bias the CPI. Thus, there is no basis for the current practice of adjusting the CPI for changes in air quality attributed to physical changes in vehicles and not adjusting the CPI for changes attributed to changing use of public transportation, bicycles, and so on.

The above presumed an ability to accurately estimate a money value for the change in air quality induced by the mandated product change. In the current CPI practice, the money value of an anti-pollution mandate is based on the cost of implementing the mandate. Although some might view this amount as an estimate of the beneficial change in air quality, it is, in the BLS view, simply a way of estimating the value of the mandated change in the vehicle characteristics—BLS makes no claim that this amount is an estimate of the dollar value of the beneficial change in air quality.[7] To obtain such estimates, one would first have to overcome the difficulties listed above and determine a benchmark value of air quality as well as movements from that benchmark. Once these were obtained, corresponding money values of the change in air quality might in principle be estimated by a variety of different methods, such as the impact of the air

[7] As described below, the other BLS price indexes use the change in cost as the basis for estimating the value of the change in a product's characteristics, and this fact underlies point (2) mentioned at the outset.

quality change on medical expenditures or mortality.[8] In practice, there is no consensus on how to do this.

Differences between the CPI, the PPI and the IPP Export and Import Price Indexes

In the CPI, the focus is on consumers and their purchases to achieve a given level of utility. In the PPI and IPP price indexes, the focus is on firms and their output given inputs and technology. Prices in all of the indexes reflect market transactions to the extent possible, although the coverage is different. The CPI includes only transactions by consumers, while the other three indexes include transactions by consumers, businesses, and government.

Because the three firm-oriented price indexes are concerned with production, the treatment of a product change concerns the magnitude of the change in product characteristics and the resources used to produce them. In the usual case of private markets where profit maximizing firms interact with consumers, economic theory suggests that firms will provide product changes only if consumers are willing to pay a price that at least covers the cost of the product change. In such cases, the treatment of changes in the quality of a product should in principle be the same in each index containing that product.

In the case of pollution-preventing measures mandated by government, however, the consistency of the quality adjustment procedure across price indexes vanishes. As pointed out in Triplett (1983), such mandated changes alter a product characteristic of the good or service in question, and this alteration requires resources (inputs) and therefore is costly. This increase in cost serves as the basis for quality adjustment in the firm-oriented price indexes. It is important to note that this quality adjustment does not depend on any evaluation of the social benefits deriving from the mandate. Accordingly, based on the earlier discussion, there would not be a similar quality adjustment in the CPI.

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[8] In addition, because not all of the benefit from the mandated change occurs in the year that the vehicle is produced, one must also estimate the discounted value of the expected stream of future benefits. This would require the estimation or selection of a discount rate, as well as an estimation of the money value of the future benefits.

The difference in treatment of the impact of mandated product changes among the BLS price indexes follows from each having a distinct measurement objective that determines the proper method of quality adjustment. This point is well established in the literature—see, for example, Famulari and Manser (1989), Gordon (1990), and Triplett (1983).

Change in Treatment and the Implication for the CPI

Effective with the data for January 1999, the CPI will no longer make quality adjustments for changes in vehicle or motor fuel characteristics arising from air-pollution mandates. Adjustments for changes in safety-related features of vehicles will continue to be made because it is possible to assign a benefit of such changes to individuals. This change in treatment is consistent with the analysis by Pollak cited above and also with the views expressed by several other experts on the CPI.[9]

The new policy will have its most significant effect on the motor fuel and new and used motor vehicle components of the index. In the vehicle indexes, the policy will apply to all vehicle models introduced on or after January 1, 1999. Since most of the 1999 model-year vehicles will be introduced before that date, the old practice will be used for the 1998-to-1999 model-year changeover in most cases.

Historically, within the CPI, quality adjustments for anti-pollution measures have been made to the new car (or new vehicle) component since 1969 (automobile model year 1970), with their estimated dollar effect published annually.[10] Since 1988, these data have also been utilized to make quality adjustments in the used car component. In addition, beginning in late 1994, quality adjustments were made for the introduction of reformulated gasoline, which was required in selected areas for compliance with the Clean Air Act Amendment of 1990. Available information is not sufficient to make possible a complete accounting of the impacts of this policy in all years.[11] The estimates

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[9] See, for example, the 1996 report by the Advisory Commission to Study the Consumer Price Index (the Boskin Commission), page 34, and the testimony by Popkin (1998).

[10] See, for example, U.S. Bureau of Labor Statistics, “Report on Quality Changes for 1998 Model Vehicles,” (1997b).

[11] In 1980, for example, mandated changes reduced automobile emissions both directly and through improved gasoline mileage, and it was impossible to separate the two effects.

presented below should be viewed, therefore, as approximations rather than as precise values.

For the period from December 1968 through December 1997, the new car component of the CPI-U rose 174.2 percent. The BLS estimates that not adjusting for anti-pollution measures would have resulted in an increase of 230.2 percent over this period. Quality adjustments for light trucks have been made since they were introduced into the CPI in 1983. (Published information on the dollar magnitude, however, is available only since 1995.) For the period from December 1983 through December 1997, this index rose 51.4 percent, but, had the quality adjustments for anti-pollution measures not been made, it would have risen by an estimated 55.1 percent over this period. The CPI used car index rose 27.2 percent between December 1987 and December 1997; had the quality adjustments for anti-pollution measures not been made, it would have risen approximately 28.8 percent over that 10-year period. The motor fuel component, whose index rose 7.5 percent between December 1993 and December 1997, would have increased by an estimated 15.4 percent over that period if adjustment for environmental quality change had not been made. The BLS estimates that the aggregate effect of these component changes on the CPI-U All Items Index would have increased the percentage change over the period from December 1968 to December 1997 from 354.4 percent to 357.7 percent.

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