Volume Title: Output Measurement in the Service Sectors

Volume Author/Editor: Zvi Griliches, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-30885-5

Volume URL: http://www.nber.org/books/gril92-1

Conference Date: May 4-5, 1990

Publication Date: January 1992

Chapter Title: Improvements in Measuring Price Changes in Consumer Services: Past, Present, and Future

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Chapter URL: http://www.nber.org/chapters/c7233

Chapter pages in book: (p. 109 - 157)

# 3 Improvements in Measuring Price Changes in Consumer Services: Past, Present, and Future

Paul A. Armknecht and Daniel H. Ginsburg

A major shift in the spending patterns of American consumers has occurred in the past 25 years. At the end of 1963, consumer services represented 34 percent of the market basket in the consumer price index (CPI) for urban wage earners and clerical workers (CPI-W). As of December 1989, consumer services represented 51 percent of the CPI-W. When the CPI for all urban families (CPI-U) was introduced in 1978, consumer services had a relative importance of 37.8 percent. At the end of 1989, they represented 55 percent of the CPI-U. There has been a shift from a predominantly commodity-oriented market basket to one that is services oriented.

Over the past 25 years substantial progress has also been made in the measurement of price change in the services sector of the CPI. These improvements have included the timeliness and availability of data that measure expenditures on consumer services as well as the sources and methods used in measuring price movements. This paper presents a summary of the major changes that occurred during this period that affect the measurement of consumer services, the improvements currently underway, and some future improvements that are being considered for implementation with the next CPI revision.

In part 3.1 we discuss improvements made when new surveys, new methodologies, new procedures, and new coverage were introduced into the CPI. These improvements include the availability of continuous data on consumer expenditures, continuous updating of outlets where consumers shop and the products and services they purchase, probability sampling within the retail

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outlet, the rental equivalence approach to home ownership, and the expansion of coverage to include more service items.

In part 3.2 we summarize studies that are currently under way for measuring price change among service items. These include the use of hedonic regression models to improve price measurement and quality adjustment, new pricing procedures for tenants' and auto insurance, and methods for handling quality changes in medical care services.

In part 3.3 we present two areas for future improvements in measuring consumer services: The first area is an alternative approach to measuring price change for medical care by pricing treatments rather than specific services. The second improvement would be shifting to a flow-of-services approach for private transportation services.

## 3.1 CPI Survey Methods and Improvements during the Past Twenty-Five Years

### 3.1.1 Conceptual Framework for the CPI

*The CPI and the COL Index*

The underlying theory of the CPI can resolve the conceptual and operational issues that arise in the course of developing and producing a price index. Pollak (1989), Gillingham (1974, 1983) and Gillingham and Lane (1982) have argued that the theory of a cost-of-living (COL) index should guide the CPI. The CPI is a modified Laspeyres index using a market basket of goods and services based on consumer spending patterns at some point in the past (called the base period). It measures the cost of purchasing the base-period market basket today. A true COL index measures the minimum cost of purchasing a market basket today that yields the same level of satisfaction as the market basket purchased in the base period. The major difference between the CPI and a COL index is that the COL index allows for the fact that consumers substitute products or services within the market basket in response to price change. For example, if the price of beef products doubles relative to poultry products, a COL index allows for the consumer to substitute chicken for beef so long as they maintain the same level of overall satisfaction. When this substitution occurs, consumers' costs of purchasing the new market basket are lower than if they had purchased the original amounts of beef and chicken. The COL index holds the standard of living constant and allows both prices and quantities to vary. The CPI holds the standard of living constant by keeping quantities fixed and allowing only prices to vary. Because of this fact, the CPI provides an upper bound to the COL index.

We can use the COL conceptual framework as a guide for the CPI. In this framework for the CPI, a consumer's welfare is determined by the flow of consumption services received, where such services can be (1) directly pro-

vided; (2) obtained coincidentally with the consumption of a nondurable good (in which case, the distinction between a consumption good and a consumption service is unnecessary); or (3) obtained from the use of a durable good owned by the consumer. In each case, satisfaction is derived from the act of consumption. Items that provide consumption services over several time periods are durable goods or assets. Purchasing such goods is not consumption; rather, it is investment, that is, the purchase of assets that provide consumption services over many time periods.

Within this framework, the CPI should measure the change over time in the cost of the market basket of consumption goods and services consumed in the base period. For the consumption services provided both from directly purchased services and from nondurable goods, this implies observing market prices and transaction levels in the base period, as well as the subsequent time path of market prices. However, for the services provided by durable goods owned by consumers, the implicit price of such services must be estimated because market transactions do not take place each time the services are consumed.

For many goods whose life expectancy exceeds one month, the cost of investment in the good during this time period is a reasonable proxy for the consumption of the goods' services during the same period. If the life of a durable good is not too long, if the secondary (used) market and the rental market for the good are not well organized, if the good depreciates fairly rapidly, or if the good is not a very big part of consumption spending, then it may be acceptable to treat the good itself, rather than the service it provides, as the item in the consumer's utility function and, therefore, as an appropriate item in the CPI. Because for many goods there is no real market for the services they provide (you cannot rent shoes), as a practical matter, there really is not any choice. However, this is not the case for all durable goods, including housing units and automobiles. You can rent them and resell them; they do not depreciate rapidly, and, however they are measured, they are an important element of consumer spending.

*Maintaining Constant Quality*

The CPI measures the average change in prices paid by urban consumers for a fixed market basket of goods and services of constant quality. The fixed market-basket approach would call for measuring price changes for the same services originally chosen for the sample. Doing this through time, however, is frequently impossible. Some services, like passenger train service between two cities, disappear altogether from the market; others, such as intracity mass transit, are improved when a subway system replaces bus service. New services, such as video rental, emerge. If all improved and new services were exact replacements for the original and disappearing services in terms of providing consumers with the same level of satisfaction, there would be no problem with comparing the price of the new service with the old when measuring

price change. However, most new and replacement services provide consumers with levels of satisfaction different from the original. Some offer improved quality; others offer reduced quality. Thus, when a service disappears, it presents a problem for the construction of price indexes because a new or improved service may offer a differing level of quality and compromise the basic underlying assumption of measuring price change for services of constant quality.

A variety of methods are used to handle the quality issue when substitute services occur. These are discussed in detail in Armknecht and Weyback (1989). When the quality of a substitute service is different from that of the previous item, an estimate of the quality difference must be made. In the CPI, the quality component in each substitution is handled in accordance with the information available. There are three principal methods for quality adjustments.

The first is to estimate the quality change by observing the difference in market prices between the old and new services at the same point in time. For example, a transportation company offers a new service, $y$, to replace eventually a current service, $x$. After $y$ is introduced, we can observe the market prices of $x$ and $y$. The current period is our overlapping month in which we collect prices for both services. The price change in the current period is computed as the price change in service $x$ from its previous price. In the next period, we will collect only the price for service $y$, and the price change will be measured by the change in the price of $y$. The current period, where we have overlapping prices for the two services, provides the estimate of quality change. The quality change is the difference in the market price between $y$ and $x$. This method of quality adjustment is referred to as overlap pricing.

The second method for handling quality change is direct quality adjustment. Ideally, we would like to obtain the market value of the quality difference between an item and its substitute. Then we can adjust the price of the old item directly for the quality change and compare the current price with the quality-adjusted price to measure price change. The market value of the quality difference is not frequently available. If suppliers of the service are cooperative, they may be willing to provide information on the value of the quality change analogous to information provided annually to the Bureau of Labor Statistics (BLS) by the domestic automobile producers at the time of the model changeover. It may also be possible to estimate the quality change from other sources, such as component services for which prices were previously available, or by using statistical techniques such as hedonic regression models.

In most cases of quality adjustments, the method used is an imputation procedure called linking. In this method no comparison is made between the price of the new and the previous service, but rather an imputed price change is used. The imputation for the price change is made using the average change of other similar services available during the comparison period. This method

assumes that the underlying price change for the service not available would have been the same as those that are available. The quality difference between the two services is the observed price change in the two services less the amount of the imputed price change.

### 3.1.2 Weighting and Item Structure

The market basket used for the CPI is based on the spending patterns of the urban population. Historically, revisions of the CPI market basket were based on one-time consumer expenditure surveys. For the 1964 CPI revision a consumer expenditure survey relating to spending patterns for 1960–61 was used. For the 1978 revision 1972–73 expenditure patterns represented the market basket. Beginning in 1979 a new program for conducting ongoing consumer expenditure surveys was instituted. Since then, it has been possible to monitor shifts in spending patterns on a regular basis to determine whether significant changes are occurring. The market basket for the 1987 revision of the CPI was the average of expenditure data from the 1982–84 surveys. We are currently in the process of developing new expenditure weights for the CPI from the 1986–88 surveys. These will be used to evaluate shifts in the CPI market basket. We will also test a reweighting of the CPI to measure the effect that the use of the most current market basket would have on price changes. If warranted, we could introduce an updated market basket for the CPI between revisions in 1992 or develop an experimental index using the more current weights.

The item structure for the CPI consists of 184 item strata in which prices are collected for commodity groups such as white bread, carbonated drinks, and boy's apparel. Within each item stratum, one or more substrata, called entry-level items (ELIs), are defined. There are 364 ELIs that are the ultimate sampling units for items selected in CPI areas. These represent the level of item definition at which BLS field staff begin item sampling within each outlet. For a detailed discussion of the sample design the reader is referred to chapter 19 of the BLS *Handbook of Methods* (1988).

The consumer expenditure survey (CE) provides the sample weights to implement item sampling. The CE consists of a quarterly interview survey and a diary survey. The interview survey collects inventories of items held by the respondent and expenditures for a full year on major consumer items (e.g., vehicles, durable goods, insurance policies); the diary survey records every purchase made during a two-week period by any member of the family. Each expenditure recorded in the CE is coded to one of the 364 ELIs used in the CPI classification structure. Estimates of annual expenditures for each item stratum by area are then produced. The average of these estimated annual expenditures for the 1982–84 period constitutes the expenditure weights currently used in the U.S. CPI.

The CE also provides information for selection of items in the CPI sample rotation process whereby the entire sample is replenished on a five-year cycle.

The CPI consists of samples for 85 urban areas. Because of their size the 29 largest areas are self-representing; the remaining 56 are probability selected to represent medium- and smaller-size metropolitan areas and nonmetropolitan urban areas. To enable the CPI to reflect changes in the market place, item and outlet samples are reselected each year for 20 percent of the areas (about 17 cities) on a rotating basis. We will discuss briefly the item selection, and in the next section present the outlet selection process.

The number of quotes assigned to each item stratum was established at the time the sample was designed by an optimum allocation model that used nonlinear programming techniques. (See Leaver et al. 1987.) The factors used in this allocation of quotes were the relative importance of the item-stratum expenditures to total consumer expenditures, the contribution of the item stratum to the variance of price change and the cost of data collection, constrained by the amount of budget.

Each year, four regional universes of consumer expenditures (Northeast, North Central, South, and West) are tabulated for the 364 ELIs from the two most recent years of CE data. The regional universe is used to select an independent sample of ELIs within each item stratum in the region. The number of quotes assigned to each ELI is accomplished by using probability-proportionate-to-size (PPS) sampling technique, where the probability of selection is the relative importance of the ELI expenditures within the item stratum. Figure 3.1 provides an example of ELI sample selection for the information processing item stratum at two different times. For the cities that had their samples rotated in 1984, the 1982–83 CE data were used. The typewriters and calculators ELI had the highest relative importance within the item stratum, followed by home computers. Therefore, typewriters and calculators

| ELI | Probability of Selection | |
|---|---|---|
| | 1984 (1982-83 CE Data) | 1987 (1984-85 CE Data) |
| Home Computers | .25055 | .34792 |
| Home Computer Software | .13491 | .18734 |
| Telephones | .13326 | .19619 |
| Typewriters, Calculators | .27819 | .21018 |
| Other Processing Equipment | .20308 | .05835 |

Probability of Selection is calculated as:
ELI Total Expenditure divided by Item Stratum Total Expenditure

**Fig. 3.1 Sample Selection Example: Information-processing equipment for region-South**

had the greatest chance of selection. For the 1987 sample-rotation cities, these ELIs reversed positions, when more current expenditure data were used, with home computers having the highest probability of selection. Thus, the ELIs selected for area samples may change on the basis of their importance in the ongoing CE.

### 3.1.3 Selection of Outlets

The second survey used for the CPI is the point-of-purchase survey (POPS), which determines the retail outlets from which consumers purchased goods and services. Since 1977 the POPS has been conducted annually in the 17 or so areas that are scheduled for sample rotation. The POPS is a household survey conducted over a four- to six-week period, usually beginning in April. Respondents are asked whether certain categories of items were purchased within a specified recall period. The recall period varies depending on the type of items purchased. Commodities and services are grouped into sampling categories (called POPS categories) based on ELIs. Some POPS categories consist of only one ELI; others are combinations. ELIs are combined into a single POPS category when certain types of commodities or services are generally sold in the same retail outlets. For example, POPS category 106, meat and poultry, consists of eight beef ELIs, six pork ELIs, four ELIs for other meats, and three poultry ELIs. These are combined because an outlet that sells beef also tends to sell other meats. For each category the respondent in the household is asked about purchases made within the stated recall period, the names and locations of places of purchase, and the expenditure amounts.

The expenditure information by outlet within POPS category is tabulated for the city and used to draw a sample of outlets. Each POPS category within a geographic area is designated a number of outlets based on an optimum allocation design for minimizing variance and cost. Each outlet's expenditures within a POPS category are used to compute the probability of selection. The sample of outlets is drawn using probability proportionate to size (PPS) procedures to select the designated number of outlets for each POPS category.

Because the item sample based on ELIs from the CE and the outlet sample based on POPS categories are selected in separate processes for each geographic area, they must be merged before the sample can be finalized. A concordance exists to map each ELI to a POPS category. Sample ELIs are assigned to the outlets selected for the corresponding POPS categories. The number of price quotes assigned for an ELI in each outlet is equivalent to the number of times the ELI was selected for the region in the item sampling process. For example, video games, home computers, and home computer software are the three ELIs in POPS category 311 (electronic equipment for nonbusiness use). If the home computers ELI is designated to receive two quotes per outlet in item sample selection and home computer software and video games are each designated one quote, then each outlet for POPS category 311 has two quotes for home computers, one quote for software and one

quote of video games. On the basis of the optimum allocation model for the CPI sample design, POPS category 311 is only designated one outlet per area. Therefore, the sample sent to the field for collection in this geographic area will only have one outlet with four quotes. If the outlet selected does not sell products that fall within the definition of one of the ELIs, then that price quote is dropped from the sample.

Thus, the number of price quotes assigned for collection in a sample outlet is determined through an item/outlet sample merge. In the outlet sample process, an outlet may be selected more than once for a given POPS category, provided the expenditures reported for the outlet are large. An example of this is a major grocery store in a small nonmetropolitan urban area with a very large number of consumers. The outlet may also be selected for more than one POPS category, for example, a major department store. If an outlet is selected multiple times for a given POPS category, the same multiple of price quotes is assigned for collection for each sample ELI matching the category. If an outlet is selected for more than one POPS category, price quotes are assigned for collection for all sample ELIs matching within each of the POPS categories. Through this process new outlets are identified and incorporated into the CPI sample. For more details on this process the reader is again referred to the BLS *Handbook of Methods* (1988).

To the extent that the ELI definitions are fairly broad, new products and services that emerge and fall within the current ELI definitions are eligible for inclusion in the sample. Products and services that do not fit within the existing ELI scheme cannot be included until new categories are defined at the time of the next CPI revision (Marcoot 1985). This was the case with home computers and software that were introduced in the early 1980s. They did not fit within the existing classification of CPI categories. During the 1987 revision of the CPI attempts were made to keep the ELI definitions broader than in the past so that as new products and services emerge they could be incorporated into the CPI sample.

#### 3.1.4 Selection of Service Items for Pricing in the CPI, 1964–1987 Revisions

In the 1964 revision of the CPI all items purchased for consumption by urban wage and clerical households should have been eligible for selection in the market basket of goods and services priced. However, this was not possible. Only those items that could "be described reasonably definitively, and were bought and sold with some degree of regularity and in sufficient quantities to have a measurable price," were given an opportunity to be in the sample of priced items. The determination of the specific items that were selected for measuring price change started with an analysis of information that was available from the 1960–61 CE.

The expenditure data reported in the CE were categorized into 52 expenditure classes (ECs) that were set up, in a general way, to serve similar human

needs, for example, furniture, fuels and utilities, apparel services, public transportation, and professional medical services. Within this EC framework, 812 items were identified as making up the universe from which the final item selection would be made using PPS methodology. The final sample contained 309 different items.

In many instances these sampling frame items consisted of a fairly well-defined commodity or service, for example, train fares, and thus no additional selection was needed before moving on to the next stage, developing a detailed specification for use in pricing. In other cases, where the selected item contained a number of related, yet distinct subitems, further item selection, again using probability, took place, e.g., psychiatrist selected from the item category other medical specialist.

The technique used in collecting price data for the CPI since 1934 has been to describe the commodity or service in such physical detail that a BLS field representative can identify it in subsequent months from among other similar items. In this way, BLS attempts to maintain constant quality of goods priced. A specification, therefore, contains a description of the physical characteristics of an item that are judged to determine its quality and influence its price. Specifications also may include features that aid in identifying the item, such as model numbers.

In practice, the process of setting up the specifications for the 1964 revision involved identifying the volume selling unique item to represent the price movement for the selected item category, for example, pricing the "usual fee for an office visit to a general practitioner or internist for a regular patient" and "usual fee for a house visit, during the day, within the corporate limits of the city, to a regular patient," to represent family doctor, office and home visits. These specifications frequently were developed after consultation with manufacturers, retailers, associations, and trade journals, and also drew from staff economists' knowledge gained through extensive market studies of the various ECs that made up the CPI. Although an attempt was made to maximize the use of national specifications, this was not always possible. Climatic conditions or regional preferences necessitated deviations. For example, in Honolulu furnace repair, the charge for repair of automatic gas safety pilot in a single-family-occupied home or for repair of a pressure atomizing-type oil burner unit in a single family home could not be priced, and thus a water-heater replacement was priced instead to represent the heating-equipment-repairs item.

The forced selection of volume selling unique items for pricing in the CPI enabled BLS to publish detailed service indexes, representing very specific items. For example, under physician fees BLS published seven item indexes: (1) family doctor, office visit; (2) family doctor, home visit; (3) psychiatrist office visit; (4) herniorrhaphy, adult; and (5) tonsillectomy and adenoidectomy; (6) obstetrical care; and (7) pediatric care; office visit. Users of CPI data could, therefore, specifically track the price movement, over time, of these

seven specific physician services. However, since there are hundreds of services performed by physicians, the overall measurement of the price movement of physician services left much room for improvement. This was especially true because the CPI prices health insurance policies indirectly, and the priced physician services are used to move not only out-of-pocket expenses not covered by insurance but also the physician services part of health insurance. (See section below covering health insurance in the CPI).

Using the volume selling item within an item category to represent the price movement for that item, meant that the CPI essentially was measuring price change for only a narrow, albeit frequently sold, group of unique items. Within the marketplace a vast array of items are sold, with different degrees of frequency. It, thus, seemed clear that broadening the selection criteria from just volume selling items would greatly improve the representativeness of the index, especially if the selection could be done at the sample outlet using probability sampling procedures, based on actual sales data. In this way, both frequently and infrequently purchased items would have a proper proportional chance for selection. In summary, the preselection of volume selling unique items for use in measuring price change in the CPI enabled BLS to publish very specific item indexes, but at the cost of not being able to include in the index measures of a very broad range of items to more closely represent the array of unique items actually purchased by the index population. If the price change for volume selling items was different from other items, a potential bias could result.

The major emphasis for the 1978 revision was to introduce probability sampling methods for the selection of unique items for pricing within the outlet. For the 1978 revision seven major product groups—food and beverages, housing, apparel and upkeep, transportation, medical care, entertainment, and other goods and services—were subdivided into 68 ECs, which in turn were split into 265 item strata. Within each stratum one or more substrata, called ELIs, were defined, yielding 382 ELIs. As mentioned before, these ELIs became the ultimate sampling units for items and were used by BLS field staff as their initial level of item definition within an outlet. A multistage probability sampling process that BLS calls disaggregation was used to make the final selection of unique items for pricing in the CPI. Using this methodology all goods and services within an ELI were, ideally, given a chance for selection in proportion to their dollar sales in each outlet.

The disaggregation process was designed to make the probability of selection of a unique item proportional to the dollar sales of the item in the outlet. As the number of items eligible for selection was progressively narrowed in each stage of this process, measures of sales were assigned to each of the groups identified. There were four methods available in measuring the sales of a group: percent of dollar volume sales, ranking, shelf space, and equal probability.

The preferred method for measuring the sales of a group was the percent of

dollar volume sales, that is, the percent that a specific group represents of the total dollar sales of all the groups listed in a specific stage of disaggregation. This method relies on the knowledge of the respondent of the dollar sales of the groups formed in the first stage of the disaggregation process. The respondent often refers to sales records or, when that was not feasible, provides estimates for the percent of sales for each member of the group. The time period on which these sales data were to be based was the 12-month period prior to the time of initiation. (Certain exceptions existed for the 40 ELIs, such as women's suits, that were identified by BLS as being potentially seasonal in at least one of the four primary census geographic regions. In such situations, the reference period related to each of two identified seasons that, when combined, covered the entire year.) If the total of the percentages provided by the respondent fell outside the range of between 95 percent and 105 percent, the respondent was asked to reexamine and adjust the values.

The ranking procedure was used when the respondent could not provide specific percents of dollar volume sales for listed groups. Ranking required an ordering by the respondent of the identified groups from largest to smallest in terms of dollar volume sales. Specific percents were then assigned to each of the groups using a ranking table. (See appendix A, Disaggregation Sheet, Form 3400A.)

The shelf-space procedure was used to estimate relative dollar volume sales when the respondent could not provide either percent of dollar volume sales or ranks. If the amount of shelf space for display of the units for selection was roughly comparable to the dollar volume sales for those units, and if those units on display accounted for at least 80 percent of the total ELI sales in the outlet, then the shelf-space method was eligible to be used. The shelf-space method took into account both display space and unit price. The display volume times the unit price was used as the approximate proportional equivalent of dollar volume sales.

The equal probability procedure had to be used if the respondent could not provide the percent of dollar volume sales, could not rank the relative importance of the groups listed for selection, and the shelf-space method could not be used. This method was to be avoided and used only if not to do so would result in a refusal. The equal probability method assigned percents to each of the groups listed solely on the basis of the number of units listed. The percents assigned were equivalent percentages (differing by no more than one percent).

In general, disaggregation was limited to five stages in order not to jeopardize cooperation and accuracy. Thus, if after five steps of disaggregation a unique item was not identified, the respondent was asked to identify the volume selling item that fell in the group selected during the fifth stage of selection. The item identified by the respondent became the unique item to be priced over time.

In order to facilitate the disaggregation process, BLS provided the field staff with numerous copies of disaggregation sheets that contain both work space

and three tables: random number table, ranking table, and equal probability table. Note that a series of unique random number tables were produced for use on disaggregation sheets. These disaggregation sheets were used to select each of the unique items that were priced for the index.

The following example of determining the characteristics of a quote for beauty parlor services demonstrates this disaggregation process. (See appendix A for the referenced forms.) The BLS field representative visited the outlet and contacted the owner who agreed to participate. The owner indicated that eight services as found on the CPI checklist for beauty parlor services for females are provided, and the BLS field representative listed them in the first box of the disaggregation sheet. The respondent was able to provide an estimate of total revenue derived from each of these eight services. The percent of total revenue for each service was calculated. (Please see disaggregation sheets in appendix A.) Next, the field representative calculated a running (or cumulative) total on the basis of the percent of sales values. Then using the random number table on the disaggregation sheet, the field representative identified the selection number 73, because this was the first stage of disaggregation and there was only one item to be selected. Thus, haircut, coloring, and shampoo were selected during the first stage of disaggregation. In the second stage, the respondent provided a ranking of the four types of haircuts performed and the percentage of sales was calculated from the ranking table for four items, yielding trim. Following the ranking procedure three additional disaggregation steps were completed yielding: type of coloring—rinse; shampoo and set; and length of hair—short. Because five disaggregation steps had been completed, the respondent was asked to identify, for the final price factor in this outlet, the volume age of client for the above selected item, which was adult. The final step in unique item selection was to circle the selected item characteristics on the ELI checklist (shown in appendix A).

Throughout the life of the 1978 revision, checklists were modified to ensure that the characteristics of disaggregated items could be unambiguously identified through the elements listed on each checklist. Through product research, current price-determining variables that make up the universe of the commodities and services that were eligible for selection were identified and incorporated into the checklist. The same disaggregation process was continued for the 1987 revision.

This disaggregation process allows a much broader range of services to be covered or represented in the index, and, although fewer detailed indexes are thus available, the broader range of covered items yields much more accurate, albeit more general, published indexes. For example, rather than seven specific physician indexes being published between 1964–77, only one overall physician services index has been available since 1978. Where before the 1978 revision BLS priced only two types of visits for general practitioners, with the advent of disaggregation procedures, sixteen types of services are now priced—eight visits and eight procedures. (See general medical practice

checklists, September 1977, in appendix A.) Note that ideally BLS would like all services performed by general practitioners to be included. However, test pricing indicated that the effort required was too time-consuming for physicians to participate in the disaggregation process. Thus, BLS had to limit the universe on which disaggregation was based to a subset of eligible services. Similar limitations were required for automobile and home maintenance and repair services to reduce the extent of the eligible item universe.

### 3.1.5 Measurement of Home Ownership in the CPI

Prior to the 1953 revision only the outright expenditures of home owners—that is, mortgage interest, property taxes, property insurance, home maintenance and repairs, and ground rent and financing charges—connected with the ownership of a dwelling were included in the index. However, only rent was priced and the above home-owner expenses were moved by the change in rent. Expenditures to purchase a home—the down payment and payments toward mortgage principal—were considered to be investments (expenditures to purchase an asset) rather than consumer expenditures and, thus, excluded from the index. Up until World War II, the imputation of home-owner costs to rents raised little question. Most wage and clerical workers, the only population covered by the CPI until the 1978 revision, obtained their shelter through renting dwellings. In addition, studies indicated that rental and owner housing were in competition and prices of each type of occupancy moved similarly.

The widespread introduction of rent controls during World War II, and their continuation after the war, combined with the increased importance of home ownership among wage and clerical workers focused attention on this concept of defining and measuring home ownership. After much study, a new durable-good theory of home ownership evolved during 1952. Behind the adoption of this theory was the general acceptance of the view that the outright purchase or mortgage payments on principal by home owners are merely substitutes for rent payments by renters and are made chiefly to provide shelter for the family and, only secondarily, for purposes of investment. Proponents of this durable-good theory felt that houses, to a degree, are similar in characteristics to other durable goods such as automobiles and appliances. Purchase of durable goods requires a sizable outlay; they possess substantial resale value; their life expectancy is very long and none are consumed immediately. So they all have an element of investment. Also, even though houses produce a marketable service—shelter—it was felt that, as long as owners choose to occupy their houses, no marketable service exists.

The treatment of home ownership in the CPI as a durable good was defined as measuring the effect of price change on the cost of acquiring and maintaining homes (Lane 1979). The expenditure value for home purchase was derived as the product of the prevailing 1952 house prices and the annual rate of purchase. Mortgage interest was derived as the product of the rate of mortgage contracting among owners, the percent of consumer units who are home own-

ers, and the average per period interest contracted per mortgagor, which was calculated by using 1951 average market value of homes in sample areas, a derived ratio of mortgage to purchase price and appropriate terms, and interest rates. Mortgage interest is, therefore, considered the price of borrowing money for the purchase of a home. The index for mortgage interest, thus, was designed to measure the change in the amount of interest required in current markets at current rates to buy houses of the same quality and at the same ratio of loan to purchase price as in the reference year. Therefore, the change in interest was the product of the change in rates for new loans on new and existing homes and the change in market value of homes as measured by home purchase. To reiterate, home purchase and mortgage interest reflected expenditures only for those owners who acquired housing in the survey reference period.

The expenditures for the remaining home ownership items—property taxes, property insurance, and home maintenance and repair commodities and services—reflected outlays for all home owners, regardless of when they purchased their homes.

Under this durable-good approach all the above expenditure elements were moved by price changes obtained through the direct collection of prices for a sample of transactions associated with each item. Essentially this same definition of home ownership was followed from 1953–82.

### 3.1.6 Owners' Equivalent Rent in the CPI

With the release of the January 1983 CPI-U, BLS changed the home-ownership component of the CPI to a flow-of-services approach. The change, first announced by Commissioner of Labor Statistics Janet L. Norwood (1981), was implemented by means of the rental-equivalence technique for measuring the shelter cost of consumers who own their own homes. BLS delayed converting the companion index, the CPI-W, until the index for January 1985 because the CPI-W is used to escalate payments in many contracts and federal entitlement programs. It was deemed necessary to give notice to affected parties well in advance of introducing the change.

In essence, the change converted the home-ownership component from a method that mixed investment and consumption elements to a flow-of-services approach that measures only shelter consumption–the cost of shelter services consumed by home owners. The expenditures to purchase new housing units or the expenditures to replace that part of housing stock that has worn out are investments to purchase assets, things that provide a flow of services. It is the monthly cost of these services that the CPI should track. BLS implemented the flow-of-services approach using the rental equivalence technique, which estimates the change in cost of housing services for home owners from the cost of renting housing services.

This conversion to rental equivalence followed many years of recommendations and research by BLS staff and by other government, academic, busi-

ness, and labor economists and statisticians—see Gillingham (1980, 1983) and Gillingham and Lane (1982). In 1980, the bureau introduced five experimental measures (CPI-U-X1–CPI-U-X5) to demonstrate the effect different home-ownership concepts and techniques could have on the all-items CPI. The measure known as CPI-U-X1, which used a rent substitution technique, is the direct (although approximate) antecedent of the method the bureau now has adopted.

To implement the measurement of price change for any CPI item, one needs a base-period expenditure weight and a monthly estimator of price change. The base-period expenditure measure for rental equivalence, or owners' equivalent rent, is the rent the stock of owner-occupied units would bring if they had been rented.

The last several CEs have asked home owners to estimate what their homes would bring if they were rented. A study by Francois (1989) of the responses to this question showed that the average estimates are reasonable. For purposes of calculating CPI base-period weights, BLS treated their responses to this question as actual consumption expenditure. The question defines implicit rent as net of utilities and household furnishings.

The weights for other CPI items, notably those for home maintenance and repairs, household insurance, and major home appliances clearly included some expenditures that were also covered by the weight for owners' equivalent rent. To avoid double counting these items, BLS adjusted the CE expenditures home owners reported for them before computing the final weights for each of the above items.

The experimental measure, CPI-U-X1, simply used the U.S. rent index as a measure of the change in the implicit rents on owner-occupied housing units (henceforth, owner units). However, the sample of rental units was not representative of owner units so that when the CPI converted to rental equivalence in 1983, the rent sample was reweighted and augmented to measure price change for owner units. From 1983–86, when they were used to measure owners' equivalent rent, the renter units were weighted according to the number of owner units in the universe they represented.

For the 1987 revision of the CPI, BLS developed an independent measure of owners' implicit rents. A new sample of renters was drawn to represent renters in owner neighborhoods. A sample of owner units was also drawn in the same area. On the basis of proximity and similarity of structural characteristics, each owner unit was assigned a small set of similar, nearby renter units. No renter unit could be assigned to more than three owner units. The change in implicit rent for each owner unit is the average change in the pure rent of its set of renter units. Pure rent is the actual rent paid, less the estimated value of utilities and furniture included in the rent. Once an implicit rent is calculated for each owner unit, the average change is obtained in the same manner as for rent. For more detail, see Kosary, Sommers, and Branscome (1984) and Lane and Sommers (1984).

This method ensures complete coverage of the owner universe. It provides a measure of change that is capable of distinguishing differences in rent movements in owner and renter areas. The new housing sample over represents renters in owner areas to facilitate matching owner units with nearby rental units. Using a multistage stratified design, the sample areas were selected in strata distinguished by tenure (percent owner occupied) and rent level (a surrogate for income). For a more detailed discussion of this the reader is referred to the BLS *Handbook of Methods* (1988).

### 3.1.7 Improvements in Other Service Items during Recent Revisions, 1964–87

In table 3.1, improvements to selected CPI service items and their basic pricing methodologies are listed for the last three CPI revisions. During the 1978 revision, BLS made several improvements in item strata representation in the CPI. For example, the following item categories were added to the list of items priced: housing at school, cable television, refuse collection, gardening services, tenants' insurance, auto financing interest rates, vehicle rental, other medical professionals (e.g., chiropractors), hospital emergency room care, nursing and convalescent homes, admission to sporting events, club membership dues, and elementary and high school tuition. The following item categories were added for the 1987 revision: care of invalids while convalescing at home, ship fares, photographers' fees, pet services, veterinarian fees, technical and business school tuition, and day care and nursery school tuition.

In addition to expanding the list of eligible items during each revision, BLS also improved the pricing methodology for many items. This was particularly true in BLS's methodology for handling health insurance in the CPI.

*Health Insurance in the CPI*

The expenditure weights in the CPI reflect direct household purchases of health insurance, including Medicare part B, plus employee contributions to insurance purchased through work. The share of premiums paid by employers is not included in the weights as these are considered to be business costs and not direct consumer expenditure.

Between 1950 and 1963, BLS priced the most widely held Blue Cross/Blue Shield family group plan in each priced area. During this time period, premium changes were reflected as follows: Premium differences resulting from changed medical care prices associated with covered services were reflected. Premium differences caused by changed utilization (change in the frequency that the policy is employed to cover expenses incurred by those insured) were reflected because such changes were viewed as not directly affecting the amount of protection offered by the policy. Premium differences resulting from benefit changes were not reflected, as they were considered to be quality changes, affecting the level of coverage under the policy. As BLS approached

**Table 3.1 CPI Service Improvements since 1964**

| Service | 1964 Revision | 1978 Revision | 1987 Revision |
|---|---|---|---|
| Hotels & motels | Sample from directories | Sample from unemployment insurance file; then CPOPS | Sample from CPOPS |
| | Regional relatives | Market basket relatives | Market basket relatives to December 1989; from January 1990 on, moved by regional relatives |
| Housing at school | Not priced | Linked in May 1981 | Priced |
| Electricity | Priced through Federal Power Commission | Priced through DOE | Priced by BLS |
| | Small no. of preselected consumptions | Consumption disaggregated at outlet | CE selected consumption |
| Natural gas | Small no. of preselected consumptions | Consumption disaggregated at outlet | CE selected consumption |
| Telephone, long-distance | Measured change in residential revenue, when rate change occurred | Priced actual sample of calls | Priced actual sample of calls<br>Added non-AT&T carriers from CPOPS |
| Water & sewer | Priced same Washington-selected consumption in all areas | Determined consumption through disaggregation at each outlet | Same as 1978 revision |
| Maintenance & repair service | Outlets selected from yellow pages | Outlets from CPOPS | Same as 1978 revision |
| | Washington-selected services | Disaggregated from among Washington-selected services | Same as 1978 revision |
| Cable TV | Not priced | Gradually introduced at rotation | Priced |
| Refuse collection | Not priced | Gradually introduced at rotation | Priced |
| Gardening service | Not priced | Minimum wage, then CPOPS | CPOPS |
| | | Certainty item | Probability item |
| Baby-sitting | Priced from state employment office who hardly ever placed baby-sitters | Priced from minimum wage | Priced from minimum wage to December 1989; January 1990 on, moved by day care. |

*(continued)*

**Table 3.1** (continued)

| Service | 1964 Revision | 1978 Revision | 1987 Revision |
|---|---|---|---|
| Domestic services | Priced from state employment office who hardly ever placed domestics | Priced from minimum wage | Gradually changing from minimum wage to CPOPS |
| Care of invalids convalescing at home | Not priced | Not priced | Priced; sample from CPOPS |
| Tenants' insurance | Not priced | Priced | Same as 1978 revision |
| Auto insurance | Priced in Washington | Priced part in Washington; rest in field | Priced mostly in field; rest in Washington |
| | Bureau rates & two deviating &/or independent companies | Selected companies from A. M. Best tape | Selected companies from A. M. Best tape |
| | Priced one set of liability limits & one car, full-size Chevrolet | Priced policy characteristics identified in policies disaggregated at each company | Same as 1978 revision |
| Auto financing | Weight moved by new car index | Priced interest rates associated with disaggregated loan characteristics | Same as 1978 revision |
| Vehicle rental | Not priced | Auto & truck rental priced | Same as 1978 revision, plus added other vehicle rental (e.g., trailers) |
| Airfares | Priced a small no. of chiefly coach fares, rest first class; priced one carrier per city; trip based on average length of air travel from city—used to identify destination. | Disaggregated to trip characteristics from CAB tape of actual trips taken from originating airport; type of fare also identified | Same as 1978 revision & provided additional broader instructions for dealing with discount fare characteristic changes; shifted to SABRE pricing |
| Other intercity transportation | Intercity bus fares—selected trips in Washington—CPI city to nearest terminal city; train fares—selected trips in Washington, based on the average length of trip from city | Intercity bus and train fares—disaggregated to trip based on scheduled trips originating in each sample city | Same as 1978 revision, plus added ship fares |

| | | | |
|---|---|---|---|
| Professional medical services: | | | |
| Physician services | Priced 7 preselected services | Priced a wide range of preselected services, with specific service priced disaggregated to each physician | Same selection process, however, now disaggregate type of fee, if more than one exists for the selected service |
| Dental fees | Priced 3 preselected services | Disaggregated to a specific service from among those provided by the dentist | Same as 1978 revision |
| Other professional | Not priced | Priced | Same as 1978 revision, plus nurses |
| Hospital services | Priced semiprivate & private room and 3 ancillary services until 1972; in 1972 dropped private room & added 6 more preselected ancillary services. | Disaggregated rooms and inpatient services from among the individual services available at the hospital<br>Added pricing emergency room & nursing homes | Same as 1978 revision, plus added outpatient stratum that includes ER and all other outpatient services |
| Entertainment services: | | | |
| Admissions | Priced adult & child movie admissions & drive-in movie admissions | Disaggregated from among the full range of admissions—movies, plays, operas, rock concerts, circuses, etc.<br>Added admission to the full range of sporting events—baseball, tennis, horse racing, auto racing, etc. | Same as 1978 revision |
| Fees for participant sports | Priced only bowling & golf-green fees | Disaggregated from among the full range of participant sports—bowling, tennis, golf, swimming, etc. | Same as 1978 revision |

*(continued)*

**Table 3.1** (continued)

| Service | 1964 Revision | 1978 Revision | 1987 Revision |
|---|---|---|---|
| Membership fees | Not priced | Priced a full range of membership organizations—golf clubs, fitness centers, auto clubs, credit cards, etc. | Same as 1978 revision |
| Fees for lessons | Priced only beginning piano | Priced a full range of lessons—music, sport, dance, language, etc. | Same as 1978 revision |
| Other entertainment services:<br>Photographers<br>Pet & veterinary services<br>Equipment rental | Not priced | Not priced | Added |
| Tuition & fees | College tuition priced | College tuition, elementary & high school tuition priced | Same as 1978 revision, plus added technical and business school tuition and day care and nursery school tuition |
| | Day care priced from state employment agencies | Not priced | Priced; sample from CPOPS |
| Personal expenses: | | | |
| Legal fees | Priced short-form will | Disaggregated from a group of preselected services | Same as 1978 revision |
| Cemetery lots | Not priced | Not priced | Added |
| Accounting fees | Not priced | Not priced | Added |

*Note:* CPOPS = current point of purchase survey.

the 1964 revision, problems with this direct method of pricing health insurance became apparent. Defining when a benefit change occurred was difficult at times. For example, was a new surgical schedule introduced to cover the increased cost of covered operations, or in part to provide an increase or decrease in the level of protection? Also, BLS research indicated that the proper methodology for handling changes in utilization should be to exclude their effect from the measurement of premium changes. BLS's new view was that utilization changes, reflecting the intensity with which the policy is used, do affect the level of benefits, by affecting the risk level associated with those insured. Therefore, premium changes associated with utilization changes (like those associated with benefit changes) should not be reflected in the index. Health insurers indicated that it was becoming more difficult to provide the premium effect of the various identified benefit changes and that no premium data were available related to the effect of utilization changes. Thus, for the 1964 revision, BLS shifted to an indirect approach to pricing health insurance.

Appropriate health insurance premium changes for the 1964 revision were defined to include the effect of changed medical care prices, administrative cost and surplus requirements, and the profit needs of commercial carriers. The index weight used for health insurance was broken down into two subweights, one reflecting the benefits companies pay out and the other representing the premium income retained to cover overhead and profits for commercial carriers. Although consumers do not directly purchase the services represented by these subweights, they pay for them indirectly through their premium payments. Also, as the prices of these elements change so do consumer payments.

Under the indirect method of pricing health insurance the expenditure weights were first subdivided between claims and retained earnings on the basis of national Blue Cross/Blue Shield and commercial data. Within the claims portion, expenditure weights were further allocated to in-hospital and out-of-hospital costs and within these to ten priced medical care items: semiprivate room, private room, operating room, diagnostic X ray, physician's office visit, tonsillectomy, herniorrhaphy, obstetrical case, and prescription drugs. The retained earnings portion was adjusted annually and also escalated from month to month on the basis of the average change in the prices representing claims. In this way, the relation between claims and retained earnings remains fixed between adjustments.

The annual adjustment for changes in the ratio of retained earnings to premium income was based on national financial data for the Blue Cross/Blue Shield and commercial carriers as reported to the Health Care Financing Administration (HCFA). For convenience, these retention factors were calculated by expressing them as a proportion of benefits (claims) rather than of total income, because the weights for the priced medical care items correspond to benefits. This ratio adjustment reflects how retained income has either increased or decreased as a proportion of benefit payments over the previous year.

Effective in February 1972, the list of unique items priced to represent hospital charges was expanded in order to provide an improved estimate of price change. This expansion also affected health insurance as the claims portion was reallocated by dropping private rooms and adding laboratory fees, in-hospital prescriptions (an anti-infective and a tranquilizer), electrocardiogram, physical therapy, intravenous solution, and oxygen.

For the 1978 revision to the CPI, BLS continued to indirectly price health insurance premiums. However, the use of disaggregation to select unique items for pricing led to improved representation of the medical care items used to measure price changes for estimating the claims portion of health insurance. In addition, BLS shifted from reflecting the retained earnings adjustment all in one month to spreading the change over the entire year and thus minimized the effect in any one month.

In the 1987 revision the indirect method for pricing health insurance was again employed. However, instead of using the medical care sample to move two sets of expenditures (out-of-pocket expenses and insurance benefits), the expenditures of the two types of payments were combined into one index. Thus, the expenditures for each medical care item are now the combination of the direct out-of-pocket expense for the item by the consumer and the indirect expense for the item paid from consumer purchased health insurance. See Ford and Sturm (1988).

The current item labeled health insurance is the portion of premium payments retained by the insurer in the form of operating expenses and profit. During the 1987 revision BLS also shifted to new retained earnings' sources. In recent years, the data reported to HCFA covering commercial carriers have shown inconsistencies, reflecting many revisions and changes in methodology. Also, both the commercial and Blue Cross/Blue Shield data obtained from HCFA suffered from lengthy lags between the reference period and the release of the data. These limitations of the data led BLS to investigate alternative data sources. After careful study improved data sources were located. The Argus health chart, which contains sample company data that must be reported to state insurance regulatory agencies, was selected for company commercial carriers. The Argus data are released with a shorter lag than HCFA data. In addition, BLS improved the timeliness of Blue Cross/Blue Shield reporting by obtaining data directly from the provider on a quarterly basis, rather than annually from HCFA.

Over the past 15 years, BLS has twice tested the direct pricing of health insurance policies. The latest effort was during 1984 and 1985. For this test, a data collection document (checklist) was created to describe accurately the numerous variable qualities and characteristics of the many health insurance policies. The checklist was used to rate, classify, and differentiate between the various health insurance policies that were included.

Health insurance schedules for insurance company policies available from a 1976–77 test pricing program were examined, and a sample of potential respondents was picked to be priced. The sample was chosen to represent

commercial carriers and Blue Cross/Blue Shield, individual and group plans, and single and family plans and to cover different coverages, qualities, price ranges, geographical areas, and so on. Next, sample respondents were contacted to collect 1984 and earlier pricing and benefit package information on these (or other similar) policies that were initiated in the mid-1970s. From this back-pricing information, an experimental health insurance index was constructed for the period 1977–84.

About 70 health insurance companies were contacted in the survey. Of the 22 companies that provided data, 16 responses representing 95 price quotes were deemed complete. The responses consisted of a fairly representative geographic distribution of policies. However, the response rate, which was poor, principally reflected the low number of the 1976–77 initiated policies that were still in force when the carriers were contacted again in 1984. Completed responses were described on the checklist along with the annual price trend of the rates they charged to subscribers. The reported health insurance premiums used in this survey were for policies purchased directly by consumers and policies purchased at work that reflect employer and/or employee contributions. Employees make considerable contributions to their own health insurance premiums. Data from the employee benefit survey conducted by BLS indicates that the percent of employees whose health insurance premiums are completely paid by their employers has been declining in recent years—from 54 percent in 1986 to 48 percent in 1989.

Utilization data, one aspect of quality change, were also requested from insurance company respondents, but only five respondents were willing and able to provide limited utilization data. At that time, appropriate data on utilization and methodology to account for utilization (quality) changes in the direct pricing of health insurance were not available, and thus are not accounted for in the experimental index. This lack of data had serious effects on the acceptability of the direct pricing approach.

Quality changes stemming from changes in benefit packages were handled in two ways: In some cases, insurance companies indicated the effect on premiums of a given benefit change, allowing the bureau to adjust these policies for quality changes. In those cases where the effect on premiums of benefit changes was unavailable and adjustments for quality could not be made, the policies were excluded from the index. The experimental index is based strictly on the premium changes of policies that did not change coverage plus those for which premium adjustments could be made for changes in coverage. Comparison of the results of the experimental direct price index for health insurance with the indirect method for the same period are shown in table 3.2.

As is evident in the comparison, the direct pricing method indicates a faster rate of increase than the indirect method currently used in the CPI. The differences between the indexes resulting from the two pricing methods may be due to a number of possible causes. Each method measures somewhat different things.

Some of the large price jumps in the direct pricing index in 1979–80 and in

Table 3.2 **Comparison of Alternative Health Insurance Price Indexes**

| December | Experimental Direct Pricing | Current Indirect Method |
|---|---|---|
| 1977 | 100.0 | 100.0 |
| 1978 | 116.8 | 100.5 |
| 1979 | 128.7 | 123.6 |
| 1980 | 164.0 | 133.7 |
| 1981 | 174.4 | 152.9 |
| 1982 | 211.6 | 177.2 |
| 1983 | 246.6 | 183.9 |

1981–82 were attributed by some insurers to shifts by many of the healthiest subscribers out of their current plans into health maintenance organizations or lower-cost, higher-deductible plans. This left the affected plans with an older, less healthy pool of subscribers who made a higher level of claims. The resulting increased costs for the health insurers may have caused some of the sharp increases in the direct pricing index. This type of utilization change is exactly the type of quality change that should not be included in the index, and the inability to obtain data on the premium effect of these utilization changes is the chief roadblock to developing a directly priced health insurance index.

## 3.2 CPI Improvements Currently Underway for Consumer Services

### 3.2.1 Using Hedonic Regression Analysis to Measure Quality Changes

As previously mentioned, most cases of quality adjustments in the CPI use an imputation procedure (linking) that excludes a price comparison of the new and the previous service and estimates the price change as the average change of other similar services available during the comparison period. This method assumes that the underlying price change for the service not available would have been the same as those that are available. If, however, price change is different for the new service, we could be missing some price change. It is often the case that providers of services use the introduction period for new or replacement services as an opportunity to change prices.

As an example of this situation consider airfares. The airlines at one point in time introduced a new set of discount airfares to replace supersaver fares. Originally, supersaver fares required a 30-day prepayment to obtain the reduced fare. The new discount fares introduced a lower price structure than the supersavers and required the 30-day prepayment. However, along with the lower fares came a 50-percent cancellation penalty, a quality difference between the fares that may/should make them noncomparable. If no other airline price changes occurred during this month, the exclusion of the discount

quotes would result in an imputed price change of zero because all other airline fares (coach and first-class) remained the same. The index, therefore, misses any possible price change occurring with the introduction of the lower discount fares under current procedures. (This problem would exist even if other fares changed but at a different rate.)

One method discussed earlier for remedying this situation would be to make a direct quality adjustment. We would like to obtain the market value of the quality difference between the original service and its substitute. Then we could adjust the price of the old item directly for the quality change. For example, when an auto insurer dropped the 50-dollar deductible on collision coverage and replaced it with a 100-dollar deductible, we were able to quality adjust for the premium difference because the new minimum service already existed in the market place. This situation occurs infrequently, however.

When market information is not available, we could ask the provider of the service to estimate the value of the change from cost data. Changes in provider's costs could be adjusted for normal profit margins and marked up to the retail level. The resulting price change serves as a proxy for consumers' valuation of the quality change, which cannot be observed directly in the market place. The success of such an approach is contingent on the willingness and ability of providers to supply the cost data. In the case of the airline example just cited, the required information could not be obtained.

Yet another approach would be to estimate the value of the quality change through statistical means because the quality change is usually manifest in some difference in characteristics. It might be feasible to measure the value of the quality change using hedonic regression techniques. The price for a service, $P$, is a function of the price, $b_i$, for each of its characteristics, $X_i$. In a linear form this would be:

$$P = b_o + \sum_{i=1}^{K} b_i X_i + e_i.$$

The estimated parameters, $b_i$, from the linear regression provide implicit prices for each of the $K$ characteristics. Whenever a quality characteristic changes, an estimated value for the amount of the quality change can be calculated from the regression parameters. Griliches (1971), Triplett (1969, 1971a, 1971b), Triplett and MacDonald (1977), Early and Sinclair (1983), and Liegey (1990) have demonstrated the use of hedonic techniques to measure and adjust for quality change in price indexes. The general form of the regression model used in these studies is log linear where the natural logarithm of price is regressed on the observed values of the characteristics. Each parameter estimate, $b_i$, in this form is interpreted as the approximate percentage change in price associated with a unit change in a quality characteristic, $X_i$.

In addition to providing a direct estimate of the quality difference resulting from a change in a characteristic, hedonic models enhance the analyst's

knowledge of the overall quality composition of the services offered. The models can be used to identify those major price factors that contribute the bulk of the quality makeup of the service. These major price factors are, in turn, used as aids by the analyst on two important fronts. First, they help analysts more clearly distinguish between significant and insignificant price determining factors and provides statistical measures of the strength of the relationship. As a result, analysts can refine their criteria for determining whether a change in a service characteristic makes the previous and new services comparable or not. Second, the major price factors can be used to redesign the collection documents (checklists) used by CPI field staff. In ordering the price factors on the checklists according to their importance in determining quality, the field staff can select the best substitute service by matching the most important quality characteristics in the designated order.

Preliminary studies in developing hedonic models for consumer services have been conducted for hospital-room stays, airline fares, intercity bus fares, and ship fares. We have not been successful so far with hospital rooms because a critical variable, level of nursing care (acuity), is not measured consistently among hospitals. We will have to improve our measurement of this variable by attempting to standardize the measure on our collection documents rather than by accepting each hospital's current measurement system for billing purposes.

The model for airline fares in table 3.3 indicates that there is a significant relationship between the natural logarithm of price and the various explanatory variables. The variables that contribute significantly to variations in price are distance (miles and miles squared), type of fare (first-class, coach), connecting flights, minimum-stay requirements, penalty for cancellation and two area dummy variables. The connecting flight variable is of interest because it may be a proxy for hub cities. There has been recent concern that fares from hub cities are higher because of lack of competition. Of primary interest to us is the coefficient for penalties. In our earlier example of the introduction of discount fares there was no information available on the amount of adjustment that should be made for the cancellation penalty. On the basis of our hedonic model we could quality adjust the previous supersaver fares, $P_1$, for the 50-percent penalty and then use the quality-adjusted price for comparison with the new discount fares in index calculations. The parameter estimate for penalty is $-0.1409$, which is then multiplied by 0.5, the amount of the penalty. The amount of the adjustment corresponding to these results in $\Delta \ln P = -.07045$, which implies $\Delta P = -.06802\, P_1$. If a supersaver fare of \$200 was previously used, we would reduce it by \$13.60 and use the resulting quality adjusted price of \$186.40 as the previous price to be compared with the new discount-fare price in the current month's index computation.

Our hope is that, as these models are refined, we will be able to use the results to improve our ability to make quality adjustments for consumer services in the CPI. Similar studies are being conducted for selected commodities.

**Table 3.3 Hedonic Regression Results for the CPI Airfares Sample**

| Variable | Parameter Estimate | Standard Error | *t*-value |
|---|---|---|---|
| INTERCEPT | 4.9481* | 0.1093 | 45.270 |
| MILES | 0.0006* | 0.00004 | 14.683 |
| MILESSQ | −4.96E-08* | 7.47E-09 | −6.639 |
| FIRST_CL | 1.1703* | 0.1385 | 8.451 |
| FF_COACH | 0.6892* | 0.1191 | 5.789 |
| CONNECT | 0.2737* | 0.0376 | 7.280 |
| ONE_WAY | 0.0985 | 0.1236 | 0.797 |
| ADV_PUR | −0.0037 | 0.0044 | −0.840 |
| PENALTY | −0.1409* | 0.0590 | −2.388 |
| MIN_STAY | 0.2040* | 0.1037 | 1.968 |
| ALASKA | −0.0174 | 0.1689 | −0.103 |
| HAWAII | −0.0177 | 0.1351 | −0.131 |
| MEX_CRBN | −0.1336 | 0.1127 | −1.185 |
| CANADA | −0.3038* | 0.1505 | −2.019 |
| EUROPE | −0.0771 | 0.1222 | −0.631 |
| FAR_EAST | 0.5623* | 0.2452 | 2.293 |

Dependent variable: LNPRICE
$R^2$ = 0.8009
Adjusted $R^2$ = 0.7909
No. of observations = 314

*Source:* Dale A. Smith, Hedonic Regression Analysis of Air Fares in the CPI. Unpublished research paper. Division of Consumer Prices and Price Indexes, Bureau of Labor Statistics.

*Notes:* LNPRICE = Log of round-trip airfare. (One-way fares were doubled.) MILES = Number of miles (one way) from origin to destination. MILESSQ = Miles squared. FIRST_CL = Dummy variable—coded 1 for first class and 0 otherwise. FF_COACH = Dummy variable—coded 1 for full fare coach and 0 otherwise. CONNECT = Dummy variable—coded 1 for connecting flights between two separate carriers and 0 otherwise. ONE_WAY = Dummy variable—coded 1 for one-way trips and 0 for round-trips. ADV_PUR = Number of days of advanced purchase required for the fare. PENALTY = Penalty as a percent of the fare for a change in itinerary. MIN_STAY = Dummy variable—coded 1 if a minimum stay is required and 0 otherwise. ALASKA = Dummy variable—coded 1 for trips with origin or destination in Alaska and 0 otherwise. HAWAII = Dummy variable—coded 1 for trips with origin or destination in Hawaii and 0 otherwise. MEX_CRBN = Dummy variable—coded 1 for trips with destination in Mexico or the Caribbean and 0 otherwise. CANADA = Dummy variable—coded 1 for trips with destination in Canada and 0 otherwise. EUROPE = Dummy variable—coded 1 for trips with destination in Europe and 0 otherwise. FAR_EAST = Dummy variable—coded 1 for trips with destination in East Asia and 0 otherwise.

*Denotes that the coefficient is significant at the 5% level.

### 3.2.2 Indirect Pricing of Automobile and Tenants' Insurance in the CPI

Currently the CPI expenditure weights for automobile and tenants' insurance reflect 100 percent of premiums paid by policyholders as reported on the CE. These lines of insurance are priced directly, that is, the index is moved by changes in premiums of policies whose benefit levels are held constant. This treatment of insurance is conceptually unsound because most of premiums paid represent payments to a pool of funds that are redistributed as claims

payments and as such should be included only in the insurance component of the index or only in the expenditure weights of the components for which the benefits are paid. At present there is some double counting, as noted below. Under the latter approach, which we prefer for the CPI, the insurance-expenditure weight should then be limited to that portion of premiums paid that are not returned to policyholders as benefit payments, that is, as retained earnings. Automobile and tenants' insurance in the CPI should then be moved by changes in these retained earnings similar to the treatment of health insurance.

Assuming the portion of premium payments that contribute to retained earnings is 10 percent, the remaining 90 percent is returned to policyholders in the form of benefit payments, which are then presumably spent on the specific goods and services covered by the insurance. For automobile insurance, this would include such items as automotive body work, medical expenses, lost wages and legal fees. Currently with direct pricing these expenditures are included in automobile insurance. With the retained-earnings approach, that is, indirect pricing, the purchases made with benefit payments would be shifted from automobile insurance to the items purchased.

In addition to reapportioning expenditure weights, a switch to indirect pricing would alter the index's treatment of changes in utilization of insurance. Under the current system of direct pricing, price changes resulting from utilization changes are reflected in the index, as BLS can neither identify nor adjust for their effect on the specific policies for which prices are collected. To illustrate with automobile insurance, assume the Northeast has an unusually bad winter with record snowfall. This causes a 50-percent increase in collision claims over what is typical for the winter season. Utilization has increased as evidenced by an increase in the expected value to a typical insured's claims payment. As a result, premiums increase, and this increase is reflected in the index.

Given the same situation with indirect pricing, this increase in utilization would have a zero net effect on the index. In period $N$, benefit payments would increase causing retained earnings to fall. In period $N + 1$, premiums would be increased to restore retained earnings and thus bring the index back to its original level. Proponents of indirect pricing suggest that this is appropriate because increased utilization suggests a higher quality policy. That is, as utilization increases, the expected value of the insured's benefit payments increase and thus improve the quality of the policy. Therefore, a price change resulting solely from a change in utilization should not affect the index. Utilization should be held constant at the level measured during the base period.

Another variable on which to compare direct versus indirect pricing is investment income. Some portion of retained earnings is invested and generates income. With direct pricing, the effect of a change in investment income is reflected in the index at least to the extent that this income is returned to policyholders in the form of higher or lower premiums. Given the highly compet-

itive insurance market, it is reasonable to assume that, although part of an increase in investment income may be held as profit, insurance companies would be forced to return some portion of this income to policyholders in the form of lower premiums. Therefore, with direct pricing, an increase in investment income may be expected to cause premiums and hence the index to decline.

Investment income would affect the index similarly with indirect pricing. Retained earnings are defined as premiums less benefits. Given the above assumption, that there is an inverse relationship between changes in investment income and premiums, there is also an inverse relationship between investment income and retained earnings. That is, as investment income increases, premiums and therefore retained earnings decrease.

Using data from the A.M. Best Company, Inc., it appears that automobile and tenants insurance indexes based on changes in retained earnings would have moved more erratically than the current measures. This is shown by table 3.4, which indicates annual percent changes in retained earnings for private passenger automobile insurance and home owners' multiperil insurance. These retained earnings are based on aggregates and reflect the financial reports of virtually all insurance organizations doing business in the United States.

Retained earnings are defined by Best as administrative costs plus profits or minus losses, that is, economic profit. This is arrived at by subtracting claims losses and policyholder dividends from net premiums earned. This can be expressed as $P - C - D = A + G$, where $P$ = premiums; $C$ = claims; $D$ = dividends; $A$ = administrative or underwriting costs; and $G$ = economic profit (can be a gain or loss).

Before the percent changes in table 3.4 were calculated, the retained earn-

**Table 3.4** **Insurance Industry Retained Earnings and CPI Insurance Indexes (% change)**

| Year | A. M. Best, Private Passenger Auto Retained Earnings | CPI-U, Auto Insurance | A. M. Best, Homeowners' Multiple Peril Retained Earnings | CPI-U, Tenants' Insurance |
|---|---|---|---|---|
| 1977 | +38.1 | + 7.6 | +21.4 | . . . |
| 1978 | − 4.9 | + 3.5 | + 1.2 | + 4.5 |
| 1979 | −11.0 | + 5.8 | −23.5 | +10.2 |
| 1980 | + 3.4 | + 7.3 | −25.0 | +10.2 |
| 1981 | −16.3 | + 5.4 | +16.0 | +10.9 |
| 1982 | − 7.2 | + 8.6 | − 7.7 | + 6.8 |
| 1983 | + 6.0 | + 9.1 | + 5.9 | + 6.7 |
| 1984 | −14.7 | + 7.8 | −12.2 | + 2.3 |
| 1985 | −13.9 | +12.1 | −15.9 | + 5.8 |
| 1986 | +11.5 | +11.8 | +47.9 | + 5.4 |

ings figure for each year was divided by claims for that year to correct for the effect on retained earnings of changes over time in volume of premiums written. Therefore, by looking at changes in these ratios rather than only changes in retained earnings, no change is reflected to the extent that premiums less dividends increase or decrease concurrently with claims.

In summary, a switch from direct to indirect pricing of automobile and tenants' insurance would result in the following changes:

1. The CPI weights for the insurances would be greatly reduced reflecting only that portion of premium payments that accrues to insurance companies' retained earnings. That portion of premium payments that accrues to benefit payments would be reapportioned among the CPI goods and services purchased by those benefit payments.

2. Utilization would be considered a quality variable. Therefore, all else being equal, the index level would be unaffected by a price change resulting from a change in utilization. Currently with direct pricing, a utilization change causes the index to move in the direction of the change.

3. The insurance indexes would be expected to move erratically and with no apparent pattern to the extent that insurance companies' retained earnings continue to fluctuate as they have over the last five to ten years.

The desirability of pricing insurance, indirectly by tracking retained earnings versus direct pricing, is then a function of how one defines the cost of insurance to the consumer. The feasibility of indirect pricing is a function of the availability of appropriate ongoing data for tracking retained earnings over time plus data that allows us to redistribute the insurance weights among the consumer expenditures made with benefit payments. For the first of these data needs, retained earnings data, the A. M. Best Company mentioned above has a wealth of annually updated data by company and line of insurance. In fact, as is evident above, they practically calculate our indexes for us. As to data for reweighting from insurance to expenditures made with benefit payments, the data appears to be less than forthcoming.

Insurance industry statistical gathering organizations such as A. M. Best do not have data that meet our needs for reweighting. Studies and reports of individual insurance companies may provide some useful breakdowns. Also, the CE may be helpful. There are questions on the CE that ask what portion of expenditures for automobile repair were reimbursed by insurance. However, currently there is no such breakdown for other expenditures reimbursed by benefit payments such as medical expenses (other than those reimbursed by health insurance), legal fees, and, in the case of tenants' insurance, dwelling contents. This means there is currently the potential for double counting these items. If indirect pricing is to be pursued, more research is required into alternative data sources and modifications to the CE might be needed to support this effort.

A final question is: What, if any, effect would a switch to pricing private

transportation as a flow of services have on the pricing of automobile insurance? This is unrelated to the question of whether to price automobile insurance directly or indirectly, but switching to a flow-of-services approach may change the type of insurance contract we wish to price. This was the case when rental equivalency, a flow-of-services approach, was adopted for the pricing of home ownership. The shift to rental equivalency entailed switching from the pricing of home owners' insurance to tenants' insurance. Similarly, the insurance component of private transportation priced as a flow of services would suggest the need for a shift from the pricing of automobile insurance on a consumer-owned car to the pricing of automobile insurance on a consumer-leased car, assuming insurance is not included as a part of the lease agreement. In fact, the norm for auto leasing contracts is for the lessee to purchase his or her own insurance. Furthermore, insurance companies treat policyholders with leased cars identically to policyholders with owned cars, that is, the insurance contract is the same whether the car is owned or leased. Therefore, the type of auto insurance contract priced would not change if we switched to a flow-of-services approach for pricing private transportation.

### 3.2.3 Develop Improved Methods for Handling Changes in Quality of Medical Care Treatment

The discussion of quality adjustment for medical care centers around what information is available to the BLS field representatives at the time of collection, relating to change in treatment associated with the visit or procedure being priced. The information on quality of technological change is only as complete as what the respondent provides. At a hospital, for example, the respondents are varied, with accountants and comptrollers providing price codes and rate information. Nurses, technicians, and pharmacists usually provide treatment and supply details. Many times the BLS field representatives do not have the opportunity to discuss the details of specific changes in services or supplies with the most qualified person. However, overall changes in service that reflect quality or technological improvements are identified by our respondents in most cases, and one of the appropriate quality-adjustment methods previously discussed is used. In many instances BLS field representatives have uncovered these changes by questioning their respondents when a large increase or decrease in price occurs. We are increasing the intensity of training BLS field staff in interviewing techniques and expect this training to lead to more frequent identification of quality changes.

Currently some hedonic regression analysis is being conducted for hospital services and physician services to determine whether any adjustments for quality can be made using regression coefficients. The problem with acuity in developing a hedonic model for hospital room charges was discussed earlier. Another problem with developing hedonic models is with the many varied procedures and supplies that are priced for the index. The mixture of services

may not allow a large enough sample at the detail needed for statistical estimation. The situation is being studied and further analysis is needed before it can be considered for us in making direct quality adjustments.

## 3.3 Future Improvements in Measuring Consumer Services

### 3.3.1 Examining Alternatives to Pricing Individual Medical Services

Most of the services priced within medical care services are individual services, for example, a brief office visit for an upper respiratory infection or an emergency room visit for a laceration. Some researchers (e.g., Feldstein 1988) have taken exception to this methodology and have encouraged the bureau to pursue pricing by treatment. Pricing by treatment would define a condition and reflect price changes for all services and procedures that apply to treatment of that condition, that is, physicians' fees, other medical professionals' fees, pharmacy costs, and hospital services.

Currently we are reflecting price changes based on diagnosis related groupings (DRGs) at hospitals in New York and New Jersey and had priced DRGs in Connecticut hospitals for approximately two years, from March 1987 to October 1989. Connecticut has recently returned to a non-DRG-based system. Approximately 365–400 DRG classifications were developed for specific illnesses and injuries. The DRGs followed somewhat those developed for Medicare patients. Each DRG includes the prescribed treatment and average length of stay. The fee includes all hospital-billed services necessary for treating the illness or injury, that is, pharmacy, laboratory tests, operating room, and hospital room charges. Introduction of required DRG-based payment systems in these states caused us to adopt their methodology because the hospitals within these states were unable to provide us with valid charges for the individual services that we had been pricing at the hospitals.

Pricing by DRG has caused a few problems, the first being the all-inclusive fee structure. In the areas where DRG pricing is required, BLS decided that, for every current hospital room or other inpatient service, a DRG would be selected for pricing. When a DRG is priced, other services are included along with the room charge, and price changes may reflect changes in the other services. The DRG priced for a hospital room could include the use of operating room and pharmacy as well as a semiprivate room and, vice versa, the DRG priced for other inpatient services could include the cost of the semiprivate room. However, because the weight for hospital rooms reflects expenditures for room services as calculated from the CE, under the DRG system more than just room rate changes affect this index.

The specific treatments and length of hospital stay associated with each DRG may change. Traditionally such changes have been considered quality factors for which quality adjustments would be required. An example of this

is change to the average length of stay. Each DRG has a designated range for an acceptable length of stay. One patient may stay slightly longer than the previous patient for the same DRG, but as long as it is within the identified range the patients would be charged the same rate. The range may be adjusted annually by the state hospital commission, and this could result in a rate change. Such rate changes are reflected entirely as price changes in the CPI because the charge to the patient for the DRG treatment has changed even though a quality change may have occurred. Another problem with pricing by DRG is the detail of what services and supplies are provided. For example, a patient with DRG 123 was charged $3,500 for this all-inclusive treatment with a length of stay between three and six days. Now this same DRG has an expanded length of stay between two and seven days, and the charge has increased to $3,700. The increase in price could be the result of change in length of stay, additional X rays, higher staff salaries, or a combination of such factors and could correspond to the same or different quality of service. Currently the bureau is not readily able to obtain such exact detail when pricing DRGs. Thus, most likely the change in price in the above example would be reflected as a price increase of 5.7 percent. BLS will be researching what can be done to clarify the amount of detail for these all inclusive fees.

Although standard CPI procedures currently price individual services at selected outlets, that should not imply that the complete cost of treating an illness is not being reflected in the index. An example is a patient giving birth by vaginal delivery with the professional medical services index reflecting changes in obstetrician, anesthesiologist and/or midwife and various hospital services, which reflect the changes in the cost of operating room, birthing room, pharmacy, laboratory tests, semiprivate room, and routine nursery. These changes would be reflected over multiple outlets and cities; thus, a price change for the complete service would be reflected in the CPI through measuring its individual parts. The method of pricing by individual service does provide more detail, and potential changes in quality can more easily be identified than when pricing a more inclusive fee such as with the DRG.

There are areas priced within professional medical services that are somewhat analogous to pricing the total treatment, as provided by the practitioner. Some of these are represented within physicians' services by allergists, obstetricians, surgeons, and orthopedists for treatment of an asthma attack, hysterectomy, hernia repair, and total hip replacement. However, due to specialization by physicians and the need for non-physician-based professionals such as physical therapists, the treatment of many illnesses or injuries cannot be accomplished at one office. When pricing by treatment, the use of multiple resources would compound the difficulties of obtaining the total price of the treatment. The DRG fee also would not be a good means of reflecting the cost of the total treatment because it does not include separately billed physicians' services that the patient utilizes for the designated DRG. Although it will be

difficult to develop the methods for pricing total treatment, BLS is planning further research in this area.

### 3.3.2 Development of a Flow-of-Services Approach to Transportation Services

The purchase of a durable good such as an automobile has traditionally been treated as a consumed item in the CPI, that is, all consumer satisfaction is attained at the time of purchase. The fact remains that a durable good continues to provide the consumer with satisfaction over an extended period of time as in the case of home purchases. In the case of automobiles the purchase provides the consumer with a flow of transportation services over a period of years. In addition, the purchase represents the acquisition of an asset that continues to have a market value for some period of time while providing the consumer with transportation services. For purposes of the CPI, we are interested in the value of the consumed service as opposed to the purchase of the asset. Over time we want to measure the change in price of the transportation service provided by the automobile if it can be separated from the purchase of the asset. This is analogous to the situation with home ownership. The major difference is that the value of the asset generally depreciates over time in the case of automobiles but appreciates in the case of housing.

As with home ownership, there are two methodological approaches that can be explored for separating the service from the asset. The first approach is to measure the user's cost of the service. The second is to measure the rental value of the service.

In a user cost framework the measure of the cost of consuming automobile services has three components: The first component is the opportunity cost that can be measured by the forgone return on investment. If the car were sold and its value invested, there would be earned interest that is forgone from holding the asset. The second component is the appreciation that might occur in the value of an automobile of constant quality. This would be the capital gain on the investment. Finally, there is the depreciation that would occur because of the aging and deterioration of the car.

A study measuring the transportation services of an automobile using the user cost methodology by Blanciforti and Galvin (1984) found that the user cost index fluctuated erratically due to the capital gains component. The best available measure for the appreciation component was the change in price of constant quality used cars after adjustment for depreciation. This measure of capital gains demonstrated extreme instability and affected the user cost index similarly. The indexes were also sensitive to the choice of interest rates on equity and varied by over 300 percent during the test period of 1978–83.

The Blanciforti-Galvin results are not uncommon when asset rental prices are estimated through a user cost methodology. Their results are similar to others who have empirically tested user cost formulations for measuring the

rental prices of owner-occupied housing and capital goods. Gillingham (1980) found that there was extreme volatility in the capital gains term of the user cost function for housing prices. Even with the use of moving averages to smooth the rate of return and the appreciation variables, there were still large variations in capital gains. Harper, Berndt, and Wood (1987) found similar effects in the volatility of the capital gain term when measuring the rental price of capital goods. Whether using an internal or external nominal rate of return user cost model, they found the rate of return and capital gains to be quite volatile and the primary sources of variation in the estimated rental price.

The other flow-of-services measurement alternative is a rental-equivalence measure. In a steady-state world of uncertainty with perfectly competitive markets and no tax distortions, it can be shown that the user cost of a durable asset is equal to its rental value (Gillingham and Lane 1982). Therefore, at equilibrium a rental-equivalence approach should yield the same price index as a properly measured user cost approach. With the extreme volatility that the user cost measure produces, it would seem appropriate to determine whether a rental-equivalence measure could be developed for automobiles.

There are potentially two distinct rental markets for automobiles: The first, currently measured in the CPI, is for short-term rentals of cars for private use. The second market, which has begun to emerge for private users in the last few years, is that for automobile leasing. The short-term market represents the use of cars by consumers for occasional use such as vacations or emergencies (when their own car is disabled) and is almost entirely composed of rentals of new cars that are at most a year old. Depreciation on these automobiles generally would exceed those of consumer-owned cars because of the intensive use by a succession of renters. This market would not be representative of the general population of automobile consumers because the depreciation and capital gains components differ.

The more appropriate market for a rental-equivalence measure is the long-term rental market for automobile leases. The purchase of the automobile by the consumer provides a flow of transportation services over an extended period of time. The leasing of an automobile by an individual is generally for a four- or five-year period. This extended rental may, therefore, be an appropriate measure of the rental equivalence for automobiles. An empirical concern is whether there is sufficient activity in the market to get continuous consumer prices over time. Examination of the leasing market by *Forbes* in 1984 indicated that somewhere between 40 percent and 50 percent of all cars produced are leased. Most of these are for business or government use. Estimates of retail leases (*Automotive News*, September 26, 1988) indicate that about 9 percent of retail deliveries of new automobiles are leased annually. (Retail leases combine personal-use leases to individuals along with leases of nine or fewer vehicles to businesses.) Information from the 1988 CE indicates that 3 percent of consumer units have consumer leases for automobiles. With the

phase out of tax deductions for personal interest spending in the U.S. tax code, consumer leases may increase in prevalence because the interest on auto loans would no longer be deductible.

*Automobile Leases*

The lease transaction consists of three parts—origination, servicing, and financing. Any or all of these services may be provided by the leasing source: an automobile dealership, an independent leasing company, or a bank with direct leasing operations.

Lease financing may also be provided by the automotive credit companies, a third-party program, a bank's direct leasing office, or a bank on a wholesale basis. Wholesale bank financing is the simple funding of a lease without ownership or servicing by the bank. Financing by a bank or credit company involves the lending of money at fixed rates for the term of the lease with the lender holding the title and lease payments as security.

There are two basic types of leases—the open-end finance lease and the closed-end or walkaway lease. The two differ with respect to who is responsible for the residual value of the vehicle at lease termination. At the start of the lease the lessor estimates the value of the automobile at the end of the lease term and takes into account the cost of the car and the anticipated depreciation during the term. This is often done using a published estimate of the residual value from an industry guide such as the *Leasing Black Book*. The residual value is needed in order to calculate the monthly lease payment. When the lease terminates, the actual market value of the automobile is determined from an independent industry source and compared to the estimated value. Liability for the difference can rest with either of the two parties.

With an open-end lease the lessee assumes responsibility for the vehicle's residual value. If the automobile is worth more at lease termination than was estimated, the lessee essentially has paid too much and is reimbursed for the difference. If the car is worth less, the lessee must pay the difference up to three times the monthly payment (the legal limit). Under a closed-end lease the lessee has no liability for the residual value. Whatever the case, the lessee is responsible for any damage beyond normal wear and tear or mileage in excess of a prespecified limit. The closed-end lease is the more prevalent.

Originally, dealers were hesitant to offer closed-end leases because they may have to absorb the residual value as a loss. In 1982 the automotive credit companies initiated a nonrecourse lease program that guaranteed the residual values in the lease. The credit corporation retained the title to the automobile, and the dealer had no obligation to buy back the car at lease termination. Dealers became much more interested in leasing arrangements as a means to boost sales and the leasing market has grown ever since.

The monthly payment in an automotive lease is based on the cost of the vehicle (which is negotiable as with a purchase), the expected depreciation during the term, interest and service charges, and a maintenance charge (if

vehicle maintenance is to be included in the contract.) Registration, licensing, state taxes, and usage and sales taxes may also be paid outright or on a monthly basis. Insurance against loss or theft of the vehicle is the responsibility of the lessee. Thus, the consumer is purchasing the use of the automobile for a fixed period and paying the costs (including interest) of the automobile's services.

*Test Pricing of Automotive Leases*

BLS attempted to test the pricing of consumer leases at their point of origination in new vehicle dealers and leasing agencies during 1987 and 1988. We found that the volume of leases at these sources was insufficient to enable price collection on a monthly basis. Between the new car dealers and independent leasing companies, there may be as many as 15,000 sources for lease origination. Given the 1987 unit volume of 900,000 retail leases (which include some business leases), this implies an average annual unit volume of only 60 leases per outlet. When this volume is further divided among the three to ten nameplates typically sold in dealerships as well as the varieties of lease terms (three to five years in length), it was almost impossible to obtain a price for a new lease on a similar vehicle in consecutive periods.

Because the pricing of leases at the point of origination is not feasible, we plan to investigate whether we can build a sample frame for lease finance sources and price leases at these outlets. Lease originators typically just arrange leases for large financing companies that purchase the car and lease it to the consumer. Lease financing is much more concentrated than lease origination. Five companies (GMAC, FMC, CC, GE Capital, and Marine Midland Bank) finance an estimated 35 percent of all leases originated each year. If we can successfully develop a sample frame, our existing pricing methodology, which was proven to be effective in the earlier test, can be employed. Our chances for success should improve because the financing outlets should have the necessary volume to quote an actual price for the selected sample of leases in most periods.

We would like to field such a test once the sample frame is developed. If pricing at lease finance outlets proves successful, we will expand our sample and develop an experimental automotive leasing index. This could lead to the possible development of a leasing-equivalence measure of transportation services in the next CPI revision.

Development of an automotive leasing index is just one step in the development of a leasing-equivalence measure. Under a flow-of-services approach expenditure weights would also have to be developed for the total value of automobile services consumed by families owning cars in the base period. Such an expenditure weight is derived by estimating the rental value of all automobiles owned by families in the base period. The rental value of each owned car could be obtained by asking owners of automobiles in the CE to estimate the rental value. It is not clear that all owners have sufficient knowl-

edge of the rental market to make such an estimate. Clearly, those who are about to or have recently terminated leases should be able to make such an estimate. Alternatively, the rental value can be estimated as a function of the depreciation in the asset value of the car over time. To estimate the rental value in this manner we need information on the asset value and stock of consumer-owned vehicles in the base period from the CE. BLS has already conducted some research into estimating rental values for automobiles owned by CE respondents by using a model similar to those used by the leasing finance companies. Research in this area will also continue.

### 3.4 Summary

BLS continuously strives to improve the measurement of price changes for consumer services in the U.S. marketplace. In the past this has occurred primarily at the time of a major CPI revision by the inclusion of more service items that are eligible for price collection. Beginning with the 1978 revision of the CPI, two new surveys were introduced—a continuing CE and the current point of purchase survey (CPOPS). These surveys have markedly changed the ability to introduce new items into the CPI, to monitor shifts in expenditure patterns of U.S. consumers, and eventually, to update the market basket more frequently. New methodologies for sampling within the retail outlet have also aided in the inclusion of new services.

Major conceptual changes have occurred in determining the price of the consumer services that should be measured in the CPI. The most notable change was for the price of shelter services that led to the use of a rental-equivalence measure of home ownership. In addition the price measurement of health, tenants' and automobile insurance have changed as a result of research into better methods for measurement of the appropriate service that is being provided to the consumer.

Considerable research is underway to improve BLS's ability to measure only pure price change in the CPI and exclude price shifts that are the result of changes in quality. The use of hedonic regression models that isolate factors that contribute to quality changes appear promising.

There will also be a continuing effort to explore alternate measures for medical care services as new technologies are introduced at a rapid pace. Finally, BLS continues to evaluate new measures that will resolve the problems of including the price change of consumer assets as measures of price change for consumed services. To this end, we are testing the feasibility of a leasing-equivalence measure for automobile transportation services. If the leasing market for individual consumers grows to become a viable rental market, we may be able to improve our measurement for this consumer service.

# Appendix A

BLS 3400B

**ELI CHECKLIST**

June 1975

| Outlet Code | Quote Code | ELI Code | Cluster Code |
|---|---|---|---|
| OC = | QC = 001 | QE = 65011 | VE = 01 |

Keypunch
QR =

Dept./Arrangement
AR =

| Price | Quantity | Size | Footnotes | Origin |
|---|---|---|---|---|
| PR = | QT = | SZ = | FN = | OG = |

ELI Title: BEAUTY PARLOR SERVICES FOR FEMALES

| Percent of POPS | Reference Period |
|---|---|
| QB = | 1 Month |

## TYPE OF SERVICES

### HAIRCUT
(A1) Trim
B1 Styling
C1 Regular
D1 Razor

### PERMANENT/SHAMPOO
E99 Permanent, brand, _____
F1 Shampoo
(G1) Shampoo and set

### OTHER HAIR SERVICES
M1 Bleaching, all over
M2 Bleaching, touch up
N1 Conditioning
P1 Straightening

### COLORING
H1 Dye, all over
H2 Dye, touch up
(I1) Rinse
J1 Frosting, with cap
J2 Frosting, with aluminum foil
K1 Streaking
L1 Tipping

### WIG SERVICE
Q1 Styling
R1 Cleaning
S1 Setting
T1 Shampoo

U1 For full wig
U2 For hairpiece

### OTHER PERSONAL CARE SERVICES
V1 Facial
W1 Manicure
X1 Pedicure
Y1 Electrolysis
AA99 Other, _____

COMPLETE THE FOLLOWING ITEMS ONLY IF THEY ARE PRICE FACTORS

### TIME OF DAY OR WEEK
AB1 Weekdays
AB2 Weekends
AB99 Other, _____

### AGE OF CLIENT
(AD1) Adult
AD2 Child
AD3 Student
AD4 Senior citizen

### LENGTH OF HAIR
AC1 Long
(AC2) Short

### EXPERIENCE OF BEAUTICIAN
AE1 Most experienced operator
AE2 Regular staff
AE3 Student

ZZ99 Data Collector comments pertinent to item priced: _____

65011-01 Beauty parlor services for females

ELI DEFINITION - Includes all types of services provided by beauty parlors for women and girls, such as haircuts, shampoo, set, permanent, facial, manicure, pedicure, hair coloring, bleaching, tinting and care of wigs and hairpieces. Hair care or other personal care products as well as wigs or hairpieces purchased in beauty parlors are not included here.

POPS DEFINITION - POPS 3 - Personal care service in beauty salons and barber shops for females - Haircuts, coloring, styling, manicures, facials, and treatments in beauty salons or barber shops.

This POPS category consists of only one ELI: 65011, Beauty Parlor Services for Females.

Frosting - Bleaching and/or dyeing small groups of hair strands all over the head.

Streaking - Bleaching and/or dyeing groups of hair strands at intervals over the head, often around the face or down the part.

Tipping - Bleaching and/or dyeing the ends of the hair in random fashion.

Electrolysis - The destruction of hair roots by electric needles.

DISAGGREGATION SUGGESTIONS - Type of service, any other price factor

Bureau of Labor Statistics
Disaggregation Sheet

U.S. Department of Labor

Page 1 of 2

The information collected on this form by the Bureau of Labor Statistics will be held in confidence and will be used for statistical purposes only.

*This report is authorized by law 29 U.S.C. 2. Your voluntary cooperation is needed to make the results of this survey comprehensive, accurate, and timely.*

Form Approved
O.M.B. No. 1220-0039

Outlet Code | ELI Code 65011 | Quote Code 001

| List of Units for Selection (a) | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| Haircut | | 10 | 10 | |
| Shampoo | | 20 | 30 | |
| Haircut/Shampoo | | 25 | 55 | |
| Cut/color/shamp | | 20 | 75 | 73 |
| Perm | | 5 | 80 | |
| Haircut/Perm | | 10 | 90 | |
| Other hair serv | | 5 | 95 | |
| Other personal serv | | 5 | 100 | |

| List of Units for Selection (a) Haircut | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| Trim | 3 | 20 | 20 | 9 |
| Styling | 1 | 40 | 60 | |
| Regular | 2 | 30 | 90 | |
| Razor | 4 | 10 | 100 | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| List of Units for Selection (a) Coloring | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| Dye, all over | 1 | 35 | 35 | |
| Dye, touch up | 4 | 10 | 45 | |
| Rinse | 2 | 25 | 70 | 89 |
| Frosting | 3 | 20 | 90 | |
| Other | 5 | 10 | 100 | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Random Number Table**

| Line No. | Number of Items for Selection (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (1) | 73 | 50, 100 | 1, 35, 68 | 12, 37, 62, 87 |
| (2) | 9 | 25, 75 | 19, 53, 86 | 7, 32, 57, 82 |
| (3) | 89 | 7, 57 | 6, 40, 73 | 9, 34, 59, 84 |
| (4) | 72 | 43, 93 | 13, 47, 80 | 9, 34, 59, 84 |
| (5) | 44 | 9, 59 | 3, 37, 70 | 25, 50, 75, 100 |
| (6) | 16 | 10, 60 | 29, 63, 96 | 22, 47, 72, 97 |
| (7) | 46 | 28, 78 | 5, 39, 72 | 16, 41, 66, 91 |
| (8) | 42 | 31, 81 | 19, 53, 86 | 24, 49, 74, 99 |
| (9) | 67 | 49, 99 | 18, 52, 85 | 15, 40, 65, 90 |
| (10) | 78 | 22, 72 | 12, 46, 79 | 5, 30, 55, 80 |

**Ranking Table**

| Rank of Items | Number of Items Ranked 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 1 | 60 | 50 | 40 | 35 | 30 | 30 |
| 2 | 40 | 30 | 30 | 25 | 25 | 20 |
| 3 | | 20 | 20 | 20 | 20 | 15 |
| 4 | | | 10 | 10 | 10 | 10 |
| 5 | | | | 10 | 10 | 10 |
| 6 | | | | | 5 | 10 |
| 7 | | | | | | 5 |

**Equal Probability Table**

| Number of Items | Post in Column C | Post in Column D |
|---|---|---|
| 2 | 50 | 50, 100 |
| 3 | 33 | 33, 67, 100 |
| 4 | 25 | 25, 50, 75, 100 |
| 5 | 20 | 20, 40, 60, 80, 100 |
| 6 | 16 | 17, 33, 50, 67, 83, 100 |
| 7 | 14 | 14, 29, 43, 57, 71, 86, 100 |

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Bureau of Labor Statistics
Disaggregation Sheet

U.S. Department of Labor

Page 2 of 2

The information collected on this form by the Bureau of Labor Statistics will be held in confidence and will be used for statistical purposes only.

*This report is authorized by law 29 U.S.C. 2. Your voluntary cooperation is needed to make the results of this survey comprehensive, accurate, and timely.*

Form Approved
O.M.B. No. 1220-0039

Outlet Code | ELI Code 65011 | Quote Code 001

| List of Units for Selection (a) Shampoo | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| Shampoo/blowl | 1 | 60 | 60 | |
| Shampoo/set | 2 | 40 | 100 | 72 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| List of Units for Selection (a) Length of hair | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| short | 1 | 60 | 60 | 44 |
| long | 2 | 40 | 100 | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| List of Units for Selection (a) | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Random Number Table**

| Line No. | Number of Items for Selection (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (1) | 73 | 50, 100 | 1, 35, 68 | 12, 37, 62, 87 |
| (2) | 9 | 25, 75 | 19, 53, 86 | 7, 32, 57, 82 |
| (3) | 89 | 7, 57 | 6, 40, 73 | 9, 34, 59, 84 |
| (4) | 72 | 43, 93 | 13, 47, 80 | 9, 34, 59, 84 |
| (5) | 44 | 9, 59 | 3, 37, 70 | 25, 50, 75, 100 |
| (6) | 16 | 10, 60 | 29, 63, 96 | 22, 47, 72, 97 |
| (7) | 46 | 28, 78 | 5, 39, 72 | 16, 41, 66, 91 |
| (8) | 42 | 31, 81 | 19, 53, 86 | 24, 49, 74, 99 |
| (9) | 67 | 49, 99 | 18, 52, 85 | 15, 40, 65, 90 |
| (10) | 78 | 22, 72 | 12, 46, 79 | 5, 30, 55, 80 |

**Ranking Table**

| Rank of Items | Number of Items Ranked 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 1 | 60 | 50 | 40 | 35 | 30 | 30 |
| 2 | 40 | 30 | 30 | 25 | 25 | 20 |
| 3 | | 20 | 20 | 20 | 20 | 15 |
| 4 | | | 10 | 10 | 10 | 10 |
| 5 | | | | 10 | 10 | 10 |
| 6 | | | | | 5 | 10 |
| 7 | | | | | | 5 |

**Equal Probability Table**

| Number of Items | Post in Column C | Post in Column D |
|---|---|---|
| 2 | 50 | 50, 100 |
| 3 | 33 | 33, 67, 100 |
| 4 | 25 | 25, 50, 75, 100 |
| 5 | 20 | 20, 40, 60, 80, 100 |
| 6 | 16 | 17, 33, 50, 67, 83, 100 |
| 7 | 14 | 14, 29, 43, 57, 71, 86, 100 |

BLS 3400A January 1978

# Appendix B

Bureau of Labor Statistics
ELI Checklist

U.S. Department of Labor

| Collection Period | Outlet Code | Quote Code | Version Code |
|---|---|---|---|
| CP= | OC= | QC= | VC= |
| Respondent | | Dept./Arrangement | |
| QR= | | AR= | |
| Price | Quantity | Size | Footnotes | Origin |
| PR= | QT= | SZ= | FN= | QG= |
| Field Agent Message | | | | |
| FM= | | | | |

ELI Number and Title: 56011 PHYSICIANS' SERVICES — Cluster Code VE= 01

CLUSTER 01 - GENERAL MEDICAL PRACTICE

SPECIALTY
- A1 Family practice (FP)
- A2 General practice (GP)
- A3 General preventive medicine (GPM)
- A4 Internal medicine (IM)

SPECIALTY SELECTED IS THE PHYSICIAN'S:
- B1 Primary specialty
- B2 Secondary specialty
- B99 Other, _____

TYPE OF SERVICE - VISITS
- C1 OFFICE VISIT, adult, minimal service
- C2 OFFICE VISIT, child, brief service
- C3 HOSPITAL VISIT, adult, initial care
- C4 HOSPITAL VISIT, adult, subsequent care
- C5 HOME VISIT, adult, limited service
- C6 EMERGENCY DEPARTMENT VISIT, adolescent, intermediate service
- C7 CONSULTATION, comprehensive
- C8 HOSPITAL VISIT, routine newborn care

| Preform Service (a) | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) | |
|---|---|---|---|---|---|
| | | | | | C1 |
| | | | | | C2 |
| | | | | | C3 |
| | | | | | C4 |
| | | | | | C5 |
| | | | | | C6 |
| | | | | | C7 |
| | | | | | C8 |

DESCRIBE SPECIFIC VISIT SELECTED ON REVERSE

| Rank of Items | Number of Items Ranked: 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 1 | 60 | 50 | 40 | 35 | 30 | 30 | 30 |
| 2 | 40 | 30 | 30 | 25 | 25 | 20 | 20 |
| 3 | | 20 | 20 | 20 | 20 | 15 | 15 |
| 4 | | | 10 | 10 | 10 | 10 | 10 |
| 5 | | | | 10 | 10 | 10 | 10 |
| 6 | | | | | 5 | 10 | 5 |
| 7 | | | | | | 5 | 5 |
| 8 | | | | | | | 5 |

EQUAL PROBABILITY TABLE

| Number of Items | Post in Column C | Post in Column D |
|---|---|---|
| 2 | 50 | 50, 100 |
| 3 | 33 | 33, 67, 100 |
| 4 | 25 | 25, 50, 75, 100 |
| 5 | 20 | 20, 40, 60, 80, 100 |
| 6 | 16 | 17, 33, 50, 67, 83, 100 |
| 7 | 14 | 14, 29, 43, 57, 71, 86, 100 |
| 8 | 12 | 12, 25, 37, 50, 62, 75, 87, 100 |

Z99 Data Collector comments pertinent to item priced:

BLS 3400B (Rev. October 1975)

504-3
Revised September 1977

C1 OFFICE VISIT, adult, minimal service
CPT 90030

SPECIFIC SERVICE
- E1 Established patient
- F1 Routine immunization for tetanus
- G1 Administered by nurse

C2 OFFICE VISIT, child, brief service
CPT 90000

SPECIFIC SERVICE
- E2 New patient
- F2 Throat examination for active tonsillitis

C3 HOSPITAL VISIT, adult, initial care
CPT 90200

SPECIFIC SERVICE
- E3 New patient
- F3 Brief history and physical examination
- G3 Initiation of diagnostic and treatment programs
- H3 Preparation of hospital records

C4 HOSPITAL VISIT, adult, subsequent care, extended service, CPT 90270

SPECIFIC SERVICE
- E4 Established patient
- F4 Detailed review of results of diagnostic evaluation (Includes discussion of: physical findings, laboratory studies, x-ray examinations, diagnostic conclusions, recommendation for treatment)

C5 HOME VISIT, adult, limited service
CPT 90150

SPECIFIC SERVICE - TREATMENT OF STABLE ESSENTIAL HYPERTENSION
- E5 Established patient
- F5 Review of recent history
- G5 Determination of blood pressure
- H5 Ausculation of heart
- I5 Adjustment of medication

C6 EMERGENCY DEPARTMENT (ROOM) VISIT
adolescent, intermediate service
CPT 90521

SPECIFIC SERVICE - TREATMENT OF SUSPECTED INFECTIOUS MONONUCLEOSIS
- E6 New patient
- F6 Review of recent illness
- G6 Examination of pharynx, neck, axilla, groin, and abdomen
- H6 Interpretation of lab tests
- I6 Prescription of treatment

C7 CONSULTATION, comprehensive,
CPT 90620

SPECIFIC SERVICE
- E7 Detailed history
- F7 Thorough physical examination
- G7 Diagnosis of illness
- H7 Recommendation of treatment
- I7 In-office

C8 HOSPITAL VISIT, routine newborn care
CPT 90285

SPECIFIC SERVICE
- E8 Physical examination of baby
- F8 Conference with parents

ADDITIONAL SERVICES INCLUDED IN FEE

T99 _____

U99 _____

V99 _____

OTHER CLARIFYING DATA

W99 _____

X99 _____

Y99 _____

Bureau of Labor Statistics
ELI Checklist

**U.S. Department of Labor**

| Collection Period | Outlet Code | Quote Code | Version Code |
|---|---|---|---|
| CP= | OC= | QC= | VC= |
| Respondent | | Dept./Arrangement | |
| OR= | | AR= | |
| Price | Quantity / Size | Footnotes | Origin |
| PR= | QT= / SZ= | FN= | OG= |
| Field Agent Message | | | |
| FM= | | | |

ELI Number and Title: 56011 PHYSICIANS' SERVICES — Cluster Code: VE= 01

## CLUSTER 01 - GENERAL MEDICAL PRACTICE

SPECIALTY
- A1 Family practice (FP)
- A2 General practice (GP)
- A3 General preventive medicine (GPM)
- A4 Internal medicine (IM)

SPECIALTY SELECTED IS THE PHYSICIAN'S
- B1 Primary specialty
- B2 Secondary specialty
- B99 Other, _____

TYPE OF SERVICE - PROCEDURES

- D1 ELECTROCARDIOGRAM
- D2 BLOOD COUNT
- D3 URINALYSIS, routine
- D4 CYTOPATHOLOGY (pap smear)
- D5 RADIOLOGIC EXAM of forearm
- D6 RADIOLOGIC EXAM of upper gastrointestinal tract
- D7 BASIC AUDIOMETRY SCREENING TEST
- D8 BASIC METABOLIC RATE MEASUREMENT

| Preform Service (a) | Rank (b) | % of Sales (c) | Running Total (d) | Sampling Pattern (e) | |
|---|---|---|---|---|---|
| | | | | | D1 |
| | | | | | D2 |
| | | | | | D3 |
| | | | | | D4 |
| | | | | | D5 |
| | | | | | D6 |
| | | | | | D7 |
| | | | | | D8 |

DESCRIBE SPECIFIC PROCEDURE SELECTED ON REVERSE

| Rank of Items | Number of Items Ranked: 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 1 | 60 | 50 | 40 | 35 | 30 | 30 | 30 |
| 2 | 40 | 30 | 30 | 25 | 25 | 20 | 20 |
| 3 | | 20 | 20 | 20 | 20 | 15 | 15 |
| 4 | | | 10 | 10 | 10 | 10 | 10 |
| 5 | | | | 10 | 10 | 10 | 10 |
| 6 | | | | | 5 | 10 | 5 |
| 7 | | | | | | 5 | 5 |
| 8 | | | | | | | 5 |

EQUAL PROBABILITY TABLE

| Number of Items | Post in Column C | Post in Column D |
|---|---|---|
| 2 | 50 | 50, 100 |
| 3 | 33 | 33, 67, 100 |
| 4 | 25 | 25, 50, 75, 100 |
| 5 | 20 | 20, 40, 60, 80, 100 |
| 6 | 16 | 17, 33, 50, 67, 83, 100 |
| 7 | 14 | 14, 29, 43, 57, 71, 86, 100 |
| 8 | 12 | 12, 25, 37, 50, 62, 75, 87, 100 |

Z99 Data Collector comments pertinent to item priced:

BLS 3400B (Rev. October 1975)

504-4
Revised September 1977

D1 ELECTROCARDIOGRAM
CPT 93000

SPECIFIC SERVICE
J1 Monitoring electrocardiogram
K1 Interpretation
L1 Report

D2 BLOOD COUNT, complete
CPT 85010

SPECIFIC SERVICE
J2 RBC
K2 WBC
L2 HGB
M2 Differential

D3 URINALYSIS, routine, complete
CPT 81000

SPECIFIC SERVICE
J3 PH
K3 Specific gravity
L3 Protein
M3 Tests for reducing substances such as glucose
N3 Using microscopy

D4 CYTOPATHOLOGY (Pap smear)
CPT 88100

SPECIFIC SERVICE
J4 Smears from genital source
K4 Screening 2 slides

D5 RADIOLOGIC EXAM of forearm
CPT 73090

SPECIFIC SERVICE
J5 Anteroposterior view
K5 Lateral view

D6 RADIOLOGIC EXAM of upper gastrointestinal tract, CPT 74240

SPECIFIC SERVICE
J6 Without K.U.B.
K6 With delayed films

D7 BASIC AUDIOMETRY SCREENING TEST
CPT 92551

SPECIFIC SERVICE
J7 Pure tone
K7 Air only

D8 BASAL METABOLIC RATE MEASUREMENT
CPT 89000

SPECIFIC SERVICE
J8 Performing BMR test

ADDITIONAL SERVICES INCLUDED IN FEE

T99 _____

U99 _____

V99 _____

OTHER CLARIFYING DATA

W99 _____

X99 _____

Y99 _____

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## Comment

Robert E. Lipsey

This is a very informative paper about the many improvements that have been made in measures of service prices in the CPI over the last 25 years. My comments are not so much on the paper itself as reflections on issues raised by the paper with respect to a few of the many topics covered.

The price of health insurance has clearly been troublesome for the BLS, and the BLS has changed the method of calculating it a number of times without settling on an ideal one. The present method is to separate health insurance expenditures into a part that is a payment for medical care and a part that is a payment for insurance, and pricing the medical care part by costs of medical services. That seems appropriate to me on the ground that health insurance is mainly one possible way of paying for medical care, and the price of the policy depends largely on medical care costs. If that is the case, the expenditure should be placed under medical care rather than insurance, except for the amount that covers the profits and expenses of the insurance companies. That would confine expenditure on insurance to the costs of spreading risk over time and among consumers, the appropriate coverage, I believe.

Of course, the price of medical services is itself a difficult item to measure. Aside from the usual quality issues, one could ask how a rise in fees attributable to a rise in malpractice insurance costs should be treated. If there were no transaction costs, all the additional payments would be returned to the consumers. In that case, should there be any rise in the price measure for consumers as a group? On the other hand, what if half the additional malpractice insurance costs went into legal fees? Would the properly measured price rise be different? Some part of the rise in the price of medical services seems to be paying not for these services but for the operation of a lottery or wealth redistribution program. Because those insurance costs are built into medical and hospital fees and are not paid directly as insurance by consumers, they appear as costs of health care. This issue is not discussed at all here but may deserve more attention from the BLS.

In the case of automobile insurance, the CPI prices the policy rather than, as with health insurance, the price of the service bought with policy proceeds. As with the health insurance, the indirect method seems more appropriate, for reasons given in the paper itself. It is true that auto insurance prices become much more volatile by this method. But that may be because auto insurance

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prices are in fact quite volatile. A rise in investment earnings by casualty insurance companies does make it cheaper to insure your car.

In both health and auto insurance, the BLS faced the problem of dealing with changes in utilization, the average frequency of claims under insurance policies. Where the change is the result of decisions by consumers that affect the composition of the insured population, as in the example cited in the paper, it seems appropriate that it be excluded from the measured price change. On the other hand, where the change is the effect of an alteration in the environment, such as a rise in the level of air pollution or an increase in the frequency of car theft, it should be recognized as a price change. If the price of health could somehow be calculated, rather than the price of medical services, the environmental effects would be captured there. For the present, however, we probably must be content with observing the effects of these environmental changes in the price of insurance.

The most troublesome problem with the pricing of medical services is the fundamental one of defining what is being purchased, and that issue is not gone into in the discussion of quality. Presumably, a patient is interested in purchasing a cure or at least an improvement in his condition, not X rays, not magnetic resonance imaging, and not even a certain amount of physician time, although the last may represent a utility to some patients. Perhaps the cost of an operation should be multiplied by changes in the probability of failure in each period. That may not be available for all procedures, but it would not seem impossible to develop such success data for some of them. One could imagine such information for cataract operations, for obstetrical procedures, and for other medical procedures. At least, this should be the goal that BLS sets for itself in this field rather than the price of a procedure itself.

Measuring the price of services raises another problem that is not discussed here. That is the fact that the purchase of a service often involves a substantial input of the consumer's time. That aspect of price is often considered in analyzing the demand for services, such as different types of transportation service or different types of retailing, but it does not enter price indexes, as far as I know. Yet, a shift to self-service can involve a rise in the price of retail services, if consumers must spend more time in searching for products and selecting them. A shift to weekend store hours or to automatic banking, on the other hand, involves a decline in price because the consumer can use less valuable time for his or her input into the transaction. There is no discussion of banking services in the paper, but an attempt to measure their price should surely take account of the shift to automatic teller machines. I think this is a fairly general issue for service prices that deserves some consideration. Of course, the consumption of goods also involves a time input by consumers. However, we evade the problem because the time expenditure comes at a later date than the purchase, and we define consumption as purchase, except in the case of housing. It is harder to evade the issue in the case of services because the consumer's expenditure of time occurs simultaneously with the purchase of the service.