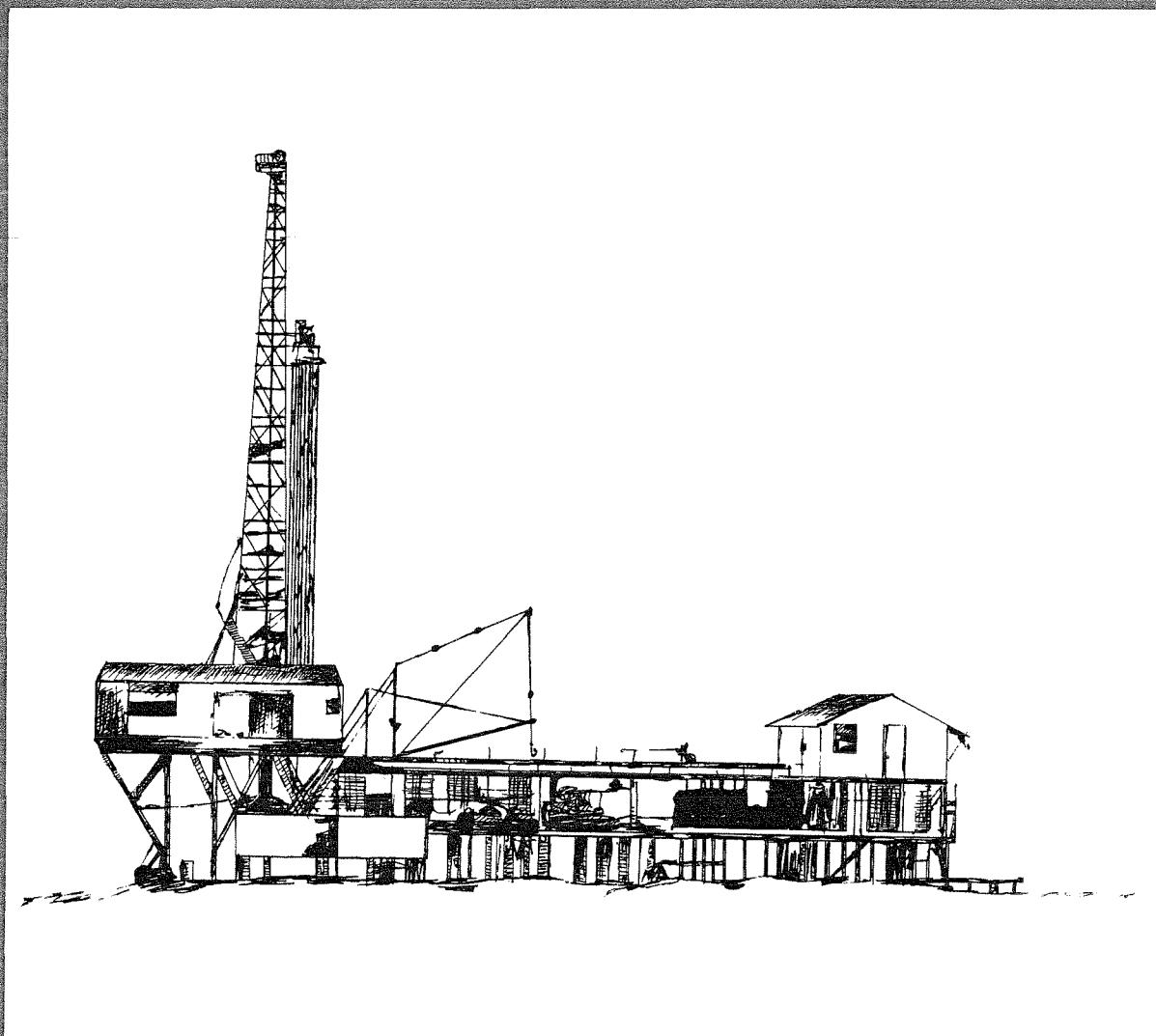


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ECONOMIC REVIEW  
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WINDFALL PROFITS,  
INTEREST RATES  
AND  
INDEX NUMBERS

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# Indexes, Inflation and Public Policy

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Herbert Runyon\*

In published polls, inflation generally tops the list of problems troubling the public. Indeed, television news programs are full of discussions of the rampancy of inflation. But most audiences remain unaware of how to measure inflation — or of what it really is.

Inflation may best be described as a substantial and continued *rise* in the *general* price level. However, the general price level is hard to define in practice and presents a number of measurement problems, since it is a single number that represents the average behavior of a great many prices during a given period of time. In a system of freely functioning markets, there can be a great deal of disparity in the movement of prices of individual commodities or services. This is to be expected, as shifting demand-and-supply conditions for specific items become reflected in their prices. As demand presses against supply for some goods, their market prices may rise relative to other goods. Of itself, this does not constitute inflation, because other prices may be falling — witness color television sets or hand-held calculators. Relative price movements of this sort are a normal manifestation of functioning markets for resources and final goods. But inflation exists only if the prices of most goods are rising, or if increases in the prices of some goods consistently outweigh declines in the prices of other goods.

As inflation has accelerated — with consumer prices doubling over the last decade — policymakers have attempted to offset its impact on living standards by indexing incomes to the cost of living. Workers, still active in the labor market, have tried to minimize their inflation-caused loss of economic welfare by negotiating cost-of-living

adjustments (COLAs) into bargaining agreements. Other groups now outside the labor market — such as the retired or disabled — instead have depended upon the political process to ensure income maintenance. These two methods of adjusting to inflation — the market process and the political process — are not necessarily comparable, and consequently have sometimes produced inequities.

The official measures of the cost of living play a significant role in public-policy decisions affecting both wages and income-maintenance programs. About two-fifths of the Federal budget consists of expenditures that are tied, or “indexed,” to some such measure. As a result, inflation significantly affects the Federal budget. And in the private sector, COLAs are imbedded in most large union contracts. Altogether, about 80 million persons are affected by indexed payment of wages or nonwage benefits. Thus, policymakers must use an index that accurately reflects change in the price level of the pattern of consumer expenditures.

The choice of a measure raises fiscal-policy questions. If the growth of the official index exceeds the increase in the actual expenditure pattern of individuals (designated here as the cost of living), real government expenditures will rise and contribute to a Treasury deficit. Moreover, if the index is upwardly biased, many wage and benefit recipients will be overcompensated. However, many cost-of-living adjustments (at least in government transfer programs) are based on the inflation rate in some earlier period (generally the preceding year). Hence, when inflation accelerates, the amount of actual overcompensation may be less than might appear; on the other hand, when inflation decelerates, the overcompensation increases.

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# I. Measuring Changes in the Cost of Living

Before attempting to measure the cost of living, we must first define what we wish to measure. The term "living" refers to individuals' consumption patterns — the sum of commodities and services they consume within a given period. We assume that consumers plan their expenditure patterns so as to achieve the maximum amount of pleasure or well-being within the income fixed for a given time period.<sup>1</sup> Hence an increase in the cost of living may occur when the income needed to secure a given level of satisfaction increases from one period to another. In principle, then, the change in the cost of living between two periods may be represented as the ratio of two incomes — with the denominator being the income in the first or "base" period, and with the numerator being the smallest income required in the second period to buy the group of commodities that affords the base period's level of satisfaction.<sup>2</sup>

However, this concept is not amenable to direct measurement, since we cannot observe degrees of individual satisfaction, and hence cannot know whether an individual is maintaining the same level of satisfaction.<sup>3</sup> This basic problem may be illustrated by considering a simple situation in which a household consumes only two commodities with prices  $P_1$  and  $P_2$  (Figure 1).

In this illustration, the point P represents the level of prices of both commodities in the

base period. Suppose now that the prices of both commodities double, as in the move from P to P'. In such a case we can say unequivocally that the cost of living has doubled, since clearly the cost of obtaining the same level of satisfaction has exactly doubled.

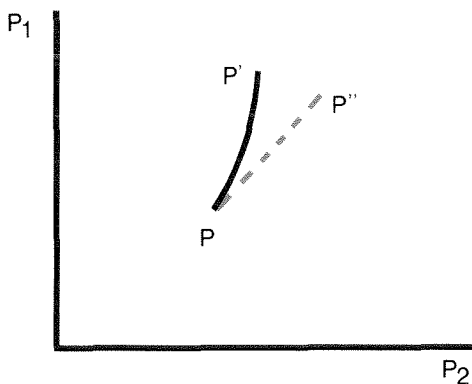
But suppose the price of commodity 1 more than doubles while that of commodity 2 less than doubles, as in the movement of prices from P to P'. The total cost of the consumption bundle may have exactly doubled, but this does not mean a doubling of the cost of living as we have defined it. In fact, it will probably have less than doubled. The consumer can probably obtain his previous level of satisfaction at less than double the cost, by buying less of commodity 1 (whose price has more than doubled) and more of commodity 2 (whose price has less than doubled). However, we cannot tell precisely how much the cost of living has risen, because we do not know how much commodity-substitution the household will undertake in any particular price situation.

Statisticians have developed index numbers to deal with the problem of measuring changes in the cost of living. Their calculations utilize the following quantities:

- $p_0$  = price of a given commodity in the consumer's expenditure pattern in time period  $t_0$
- $q_0$  = quantity of the given commodity purchased by the consumer in  $t_0$
- $p_1$  = price of the commodity purchased in  $t_1$
- $q_1$  = quantity of the commodity purchased in  $t_1$ .

One approach — the Laspeyres index — maintains a fixed composition of the pattern of goods and services consumed in the base period. (The index was developed by the 19th-century French-German economist, Etienne Laspeyres.) Here, the amount spent on an individual commodity is represented by the price multiplied by the amount purchased, or  $p_0 q_0$ , for the base year. Hence total expenditures of consumers in the base period  $t_0$  are simply the sum of these products of price and quantity, or  $p_0 q_0$ . In order to compute a

Figure 1



Laspeyres index for a later period,  $t_1$ , we must calculate the quantities purchased in the base period  $t_0$  at the market prices prevailing in the later period  $t_1$ , or  $p_1 q_0$ . Total consumer expenditures are then represented by  $p_1 q_0$  and the entire index by

$$L = \frac{\sum p_1 q_0}{\sum p_0 q_0}$$

In this formula, the denominator represents the amount actually spent in the base period, while the numerator represents how much that same bundle of commodities would have cost in the second period.

An alternative approach — the Paasche index — weights prices at current-period quantities. (This index was developed by Laspeyres' German contemporary, Hermann Paasche.) Where the Laspeyres index projects the consumer-expenditure pattern *forward* from the base period  $t_0$ , the Paasche index projects the pattern *backward* from the current period  $t_1$  to the past period  $t_0$ . The formula for the Paasche index is therefore

$$P = \frac{\sum p_1 q_1}{\sum p_0 q_1}$$

In this formula the numerator represents the amount actually spent in the current period,

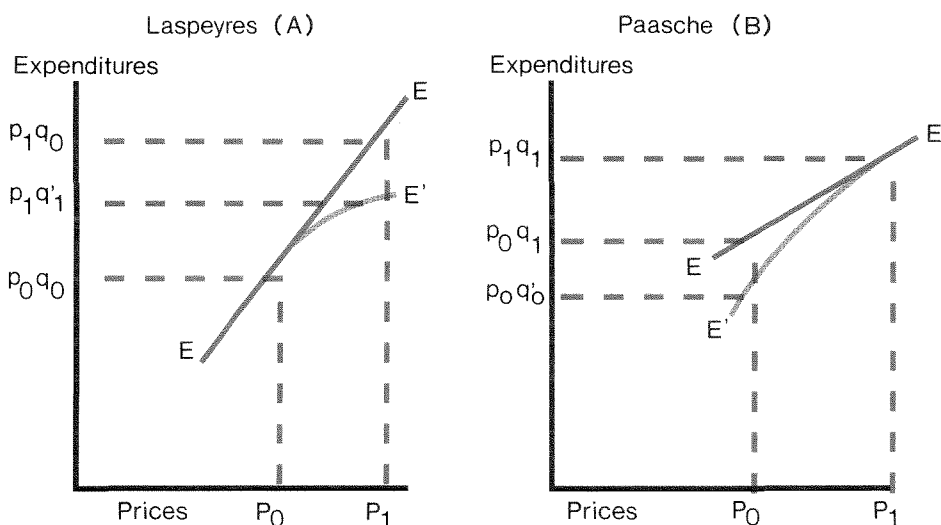
while the denominator represents how much that bundle would have cost in the past period.

### How Do Indexes Differ?

Because of their difference in approach, the two indexes may differ considerably as measures of the cost of living. The base-period consumption bundle is fixed for the Laspeyres index, so that it makes no allowance for substitution in the consumption pattern. However, as relative prices of goods change, consumers may find it advantageous to switch from higher-priced goods to lower-priced substitutes. The classic example is the relative price of beef and chicken. As the price of beef rises, the consumer can substitute chicken in his diet and expenditure pattern. But the Laspeyres index, being a base-period fixed-weight index, assumes that consumers will continue to buy the same quantity of beef purchased in the base period rather than turn to chicken. With substitutions disallowed in the base-year consumption pattern, expenditures for the more expensive beef receive too great a weight and chicken too small a weight. Hence the index overstates the true increase in the cost of living.

The Paasche index, being based upon the

Figure 2



current consumption-expenditure pattern, does allow for substitution — but in a way that understates the rise in the cost of living (Figure 2). Consumers may substitute on the basis of changes in relative prices, and thus avoid part of the burden of generally rising prices, but in doing so they lose the satisfaction of consuming the more expensive good which they originally desired.

In each panel of Figure 2, the curve  $EE'$  is the consumer's expenditure function, or the amount of money necessary to maintain the same level of satisfaction in periods  $t_0$  and  $t_1$ , assuming unchanged tastes. The consumer faces different sets of relative prices in the two periods, with some prices rising, some falling and others remaining unchanged. However, on average, in a period of inflation, the total expenditure necessary to maintain the same standard of living (in terms of personal satisfaction) will rise. The curve  $EE'$  traces out the amount of expenditures needed at different times to maintain a given standard of living.

In Panel A (Laspeyres index), the expenditure line  $EE$  denotes the total cost of the base-period consumer-expenditure pattern at the prices prevailing in period  $t_0$  (as expressed by the vector  $p_0q_0$ ) and at the prices prevailing in  $t_1$  (as expressed by the vector  $p_1q_0$ ). Although no allowance is made for substitution, the consumer will adjust his expenditures if faced with a different set of *relative* prices in period  $t_1$ . He will substitute lower-priced for higher-priced goods in order to minimize total expenditures while maintaining the same level of satisfaction, thereby moving along expenditure function  $EE'$  rather than  $EE$ . The quantity  $p_1q'_1$  represents the expenditures required to maintain the same level of satisfaction in period  $t_1$  as in period  $t_0$ .

In panel B (Paasche index), we project the consumer-expenditure pattern  $p_1q_1$  in  $t_1$  backwards along  $EE$  to period  $t_0$ , where the expenditure vector is  $p_0q_1$ . However, this ignores the substitutions made in the expenditure package between  $t_0$  and  $t_1$ , which would make the actual expenditure line  $EE'$ . The quantity  $p_0q'_0$  represents the expenditure which would have been

required in period  $t_0$  to achieve the same level of satisfaction attained in period  $t_1$ .

Substitution makes a considerable difference between the measured and "real" change in the cost of living. In the case of the Laspeyres index, the measured change is the ratio of  $p_1q_0$  to  $p_0q_0$ . If the consumer makes substitutions in his consumption pattern on the basis of changes in relative prices, the true change in the cost of living will reflect these substitutions and will be the ratio of  $p_1q'_1$  to  $p_0q_0$ . The Laspeyres index thus overstates the change in the cost of living. Empirical studies of the substitution phenomenon suggest that the effect, while negligible with stable prices, becomes significant as the inflation rate rises.<sup>4</sup>

The expenditure schedule in panel B can be considered in much the same way. Here again, the schedule  $EE'$  represents substitution in the expenditure pattern between  $t_0$  and  $t_1$ . The Paasche index assumes that at base-period prices  $p_0$ , consumers would have made expenditures  $p_0q_1$ , which is not what consumers would have spent given the change in relative prices. The pattern of  $q_1$  consumption is heavily weighted with goods and services which were relatively expensive in the earlier period. Thus, by overstating base-period expenditures, the Paasche index *understates* the rise in the cost of living.<sup>5</sup>

### Durable Goods and Price Indexes

When dealing with price indexes, we assume that the goods and services purchased during a specified time period are consumed in the course of that period. This is obvious in the case of nondurable goods and services, such as a hamburger, an opera performance or a haircut. None of these items can be used more than once. But problems occur with durable goods, such as houses, autos, furniture and appliances. By definition, such items provide services for at least three years, and some of them much longer.

We expect a new house to provide shelter for up to 80 years, and an auto to provide transportation for (say) ten years.<sup>6</sup> However, the full cost of a durable good is picked up in the first period rather than being allocated over

its useful service life.

The present value of an asset is determined by the value of the stream of services that it is expected to yield during its service life, as well as by the market rate of interest. For this reason, the inclusion of durable goods in a cost-of-living index distorts the pattern of actual consumption expenditures over a single period. By including the actual market price of such an asset in the index at the time of purchase, we greatly overstate the price of the *services* of this durable good for that period.

Moreover, the value of durable goods

belongs in the consumer's balance sheet as part of his stock of wealth, rather than in his consumption-expenditure pattern. To the extent that ownership of a home or other durable good generates capital gains, it effectively reduces the cost of the services yielded by that good. The effectiveness of any price index thus depends, to a great extent, upon the way that statisticians handle these two attributes of durable-goods purchases — the stream-of-services attribute and the investment-good attribute.

## II. Two Indexes of the Cost of Living

The most widely used price index, which has official sanction in the indexing of labor agreements and retirement benefits, is the Consumer Price Index (CPI). The Bureau of Labor Statistics (BLS) has compiled this index ever since World War I, when it was developed to help determine wage rates in the shipbuilding industry. The other major index is the implicit price deflator for the personal-consumption expenditure (PCE) sector of the national-income accounts. The two indexes differ in several respects, such as population coverage. The CPI covers the expenditures of urban consumers, and represents about 80 percent of the population; the personal-consumption deflator covers "persons" as defined in the national-income accounts, chiefly individuals and non-profit institutions. The indexes also differ in terms of items covered; the CPI regularly covers a selected list of about 400 items, while the PCE includes all goods and services currently consumed.

The CPI is a straightforward Laspeyres index with the form

$$CPI_t = \frac{P_t Q_{1972-73}}{P_0 Q_{1972-73}} \quad (3)$$

BLS chose the base-year weights on the basis of a 1972-73 survey of expenditures by about 20,000 family units. For most durable-goods purchases, the agency utilized interview panels in which consumer units were interviewed

quarterly over a 15-month period. For less expensive day-to-day purchases, the agency utilized diaries of actual expenditures kept over a two-week period. These two efforts were supplemented by a point-of-purchase survey conducted in 1974, and updated on a regular schedule.<sup>7</sup>

BLS includes almost 400 categories of goods and services in its statistical market basket, pricing them on a monthly basis. Interviewers contact a sample of about 18,000 retail establishments, such as supermarkets, cleaning establishments, repair shops and professional offices. Questionnaires provide other data — such as utility rates, transportation fares, and information not requiring personal visits — and Federal agencies and private research organizations add further information.

The PCE deflator is widely used as a cost-of-living index, although it was not designed for that purpose. It results from the procedure used to deflate personal-consumption expenditure values into constant (1972) dollars, in order to obtain a measure of change in the physical volume of consumption. With its current-period reference weights, the PCE is a Paasche index<sup>8</sup> with the form:

$$PCE_t = \frac{P_t Q_t}{P_{1972} Q_t} \quad (4)$$

The two indexes differ in commodity composition, as well as in population coverage and

statistical form. About three-quarters of the components of the CPI and the PCE indexes are comparable, largely because of the deliberate use of CPI components in generating the PCE index. Most of the differences occur in the components of homeownership, autos and allied services, and hospital charges and health insurance. The homeownership cost in the

PCE is based upon the imputed rental cost of owner-occupied homes, whereas the comparable item in the CPI is based on home purchase prices and new-home mortgage rates. Both indexes treat durable goods on the basis of current purchase prices, rather than the cost of the stream of services which they yield.<sup>9</sup>

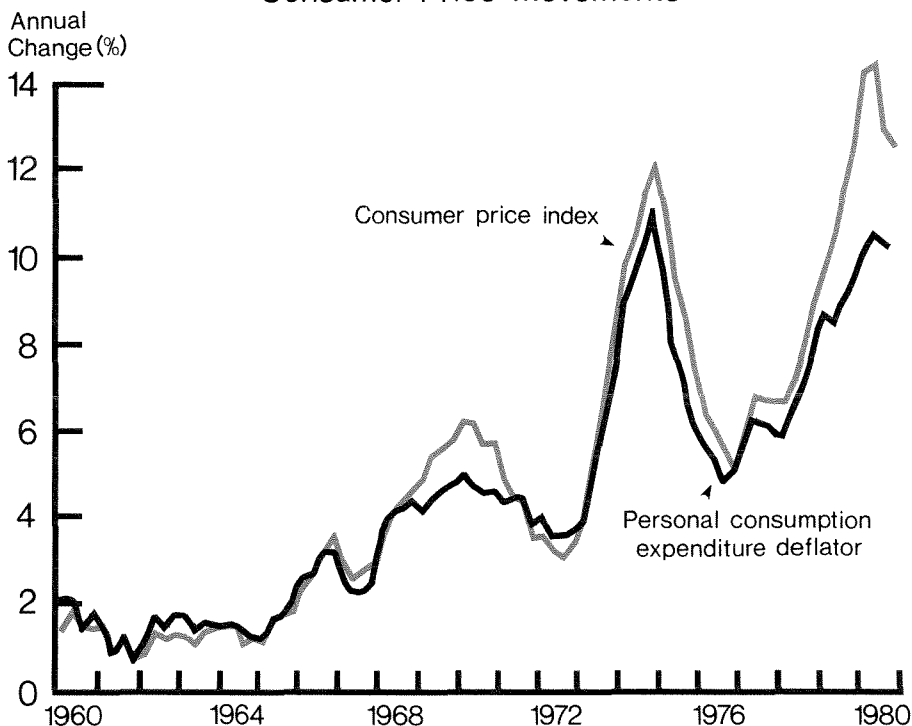
### III. Relative Performance of the CPI and PCE

In comparing the historical performance of the CPI and PCE, we should keep in mind the conceptual differences of the indexes and the manner of their construction. Neither captures the "real" cost of living; rather they form an upper bound (Laspeyres) and a lower bound (Paasche) to the cost of living. This can be seen from an analysis of the past two decades, which contained one period of relative price stability and two episodes of high inflation (Chart 3). For most of this period, the rate of change in the CPI, a Laspeyres index, was

above that of the PCE, a Paasche index. For the entire 20-year period, however, the average difference amounted to only 0.6 percentage points (Table 1).

In the first half of the 1960's, when prices were reasonably stable, the CPI perversely showed the lower rate of change — but the difference was hardly significant, especially in view of the low rate of inflation prevailing at that time. Again, the two indexes showed much less correlation than would normally be expected, in view of the heavy use of CPI

Chart 1  
Consumer Price Movements



prices in the generation of the PCE. The much lower correlation in this period reflects the fact that both indexes moved within a fairly narrow range, given the low level of inflation. Because the general price level was comparatively stable, variations in *relative* prices thus tended to cause greater variation about the general price level.

The 1973-75 and 1978-80 episodes of inflation were different, both in relation to each other and in relation to the earlier period of stability. As expected, the CPI measured more inflation than the PCE in both episodes. But meanwhile, the inflation of 1973-75 was more general in scope than the 1978-80 episode. In 1973-75, the U.S. economy felt the impact of world-wide inflation in the prices of internationally traded commodities, partly food but especially petroleum. Food and energy prices also contributed to the 1978-80 run-up in inflation, but the divergence in the two indexes in this later period largely reflected a sharp rise in the price of houses and in home-mortgage rates (Chart 4). The divergence thus could be explained by the fact that the PCE incorporates only the CPI's relatively slow-rising rental component, rather than the CPI's fast-rising home-ownership component.

### Weighting Problem

The differences in the CPI and the PCE are rooted in their basic conceptual natures, including differences in weights and the effects of substitution in the consumer-expenditure package. To understand these differences, we can compare the rates of change in CPI, the PCE, and also the fixed-weight PCE, which has some of the features of the other two

measures (Table 2). The fixed-weight PCE is a Laspeyres index — like the CPI but with a 1972 expenditure pattern. At the same time, the fixed-weight PCE weights specific consumer items in the same way that the PCE does.

Consider the weight, or relative importance, of three major PCE components on a fixed-weight vs. a current-weight basis. In 1972, housing expenditures accounted for 15.3 percent of total consumer spending, but by 1980, this had increased to 17.6 percent of the total in terms of 1972 dollars. At the same time, the weight of food in the index dropped from 20.5 percent in 1972 to 19.4 percent in 1980, while gasoline and oil dropped from 3.4 percent to 2.8 percent. Thus, in terms of 1980 consumption patterns, the fixed weight PCE under-represented housing and over-represented food and gas and oil. Of course, the composition of weights can change in a current-weighted index as changes occur in relative prices, and in consumer tastes and income.

Weighting differences were not significant in 1977-78, but they began to tell in 1979. Home prices and mortgage costs began to soar, leading to a spread of 1.9 percentage points between the CPI and the fixed-weight PCE (Table 2, line 4). But at the same time, a significant amount of substitution took place in the consumer-expenditure package because of sharp changes in relative prices, leading to a spread of 2.8 percentage points between the fixed-weight PCE and the current PCE (line 5). An increase of more than 50 percent in retail gasoline prices resulted in a decline of 11 percent in real purchases of gasoline and nearly 10 percent in real purchases of fuel oil

**Table 1**  
**Average Annual Rates of Change in the CPI and PCE Indexes,**  
**and Coefficients of Determination between the Indexes**  
**(change in percent)**

	1960I-1980IV	1960I-1965IV	1973I-1975IV	1978I-1980IV
CPI	5.29	1.35	9.59	11.81
PCE	4.69	1.50	8.34	9.35
R <sup>2</sup>	.975	.667	.969	.947



and coal, not to mention an 11-percent cut in auto spending. As a result of these changes in current consumption, the composition of weights changed substantially between the current-weight and fixed-weight PCE.

In 1980, the situation was reversed, with the largest difference occurring between the CPI and the fixed-weight PCE (line 4), reflecting the different treatment of homeownership. The homeownership component of the CPI rose by nearly 17 percent from the end of 1979 to the end of 1980, as compared with a 9-percent increase in the PCE in the same period. Because of this difference, and the heavier weighting of homeownership in the CPI, that single component accounted for roughly half of the difference in the overall indexes in 1980. The much smaller difference between the two PCE indexes was due to declines in real expenditures for food and gas and oil,

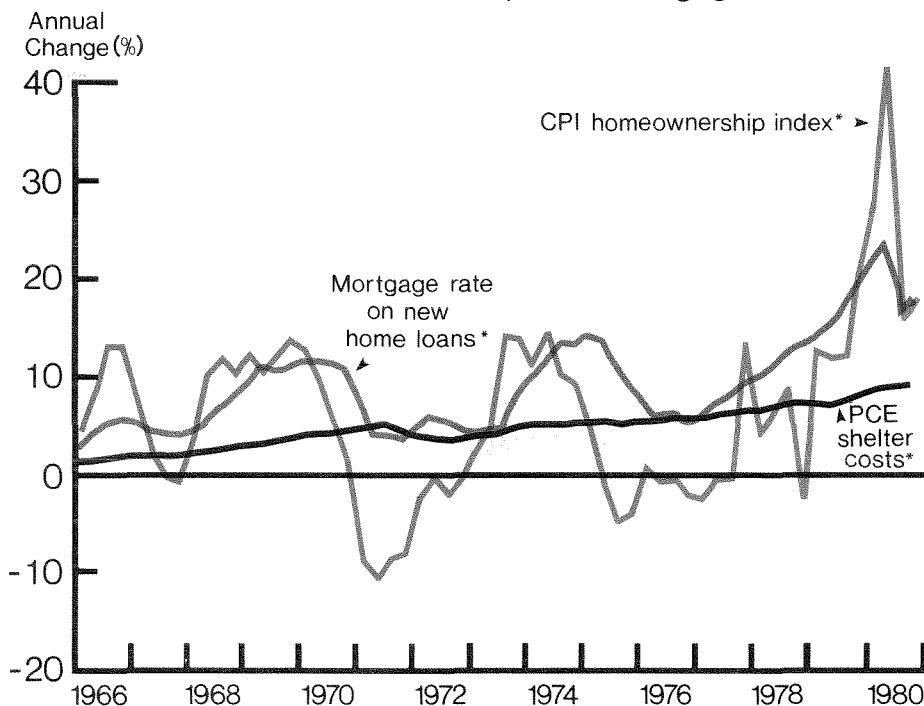
which changed the composition of PCE expenditures for the year.

### Homeownership Problem

BLS' problem with measurement of homeownership costs stems partly from its treatment of home prices. The agency computes the weight from the purchase prices of homes bought in the survey year, minus the prices of homes sold in that year, plus transaction costs accompanying the purchase or sale. It then derives the index from price data supplied by the Federal Housing Administration. But the FHA sample is a small and unrepresentative segment of the market. The coverage is not geographically uniform; also, with its ceiling cutoff on mortgage loans, higher-priced homes are effectively eliminated from the sample.

Problems also occur with the computation of mortgage cost. BLS assumes that the mortgage

Chart 2  
Rental, Homeownership and Mortgage Costs



\* Year-over-year rate of change

borrower pays interest equal to the sum of all interest payments over the first half of the life of the mortgage, each year's interest cost being equal to the first. But this results in overcounting, in comparison with discounting the value of future house services (as reflected in the future stream of interest payments) to their present value. Moreover, many analysts suggest using the actual interest paid on *all* mortgages instead of the current new-home rate, to diminish the impact from sharp fluctuations in mortgage rates.

The CPI's weighting of homeownership overstates its importance in the cost of living. Homeownership accounts for nearly one-quarter of the total weight of the index. With that weight, it has five times the importance of the rental component. In the PCE, homeownership is only about 2½ times as important as rental housing — a more reasonable figure, in view of the 2-to-1 relationship of owners to renters in the national housing stock.

In response to these and other criticisms, BLS is currently publishing five experimental measures of housing costs. These range from a rental index to various "shelter" and "asset" concepts. Conceptually, much can be said for a rental-equivalence measure, such as is used in the PCE index, since it directly measures the price of the services of a home. However, BLS does not at this time possess a true rental-equivalence sample; that is, one made up of housing units comparable in type and location

to its sample of owner-occupied units. The rental index, as presently constituted, is based upon market observations of rental payments. The units involved in this sample generally differ from owner-occupied dwellings in such terms as age and income of inhabitants, as well as age, location and size of dwelling. Thus, the current CPI rental index cannot serve as proxy for the imputed rent of the different and larger population of owner-occupied units. The concentration of the rental sample in inner-city areas — many of them rent-controlled — also tends to bias the sample downwards, so that this is one of the slowest rising components of the entire CPI.

Other considerations must be kept in mind when choosing an inflation index. The CPI in its present form substantially overestimates the rate of inflation — even more than might be expected from a Laspeyres index. However, a Laspeyres (CPI) index number seldom needs to be revised, being based on actual prices taken from primary sources and on fixed base-year quantities. On the other hand, the PCE index depends heavily on estimation procedures and thus is subject to frequent revisions, which can create problems of interpretation for policymakers. However, over the 1960-80 period, revised estimates of PCE rates of change were only slightly higher than the initial observations. Both the average rate of change and its variation were smaller for the PCE than for the CPI over this period.

**Table 2**  
**Average Annual Rates of Change**  
**in the CPI, PCE and Fixed-Weight PCE Indexes**  
**(percent)**

	1960-80	1977	1978	1979	1980
(1)CPI	5.29	6.5	7.7	11.3	13.5
(2)PCE	4.69	5.8	7.3	8.5	9.0
(3)PCE (fixed weight)	4.71	6.3	7.6	9.4	9.6
(4)CPI - PCE (fw)	0.58	0.2	0.1	1.9	3.9
(5)PCE (fw) - PCE	0.02	0.5	0.3	2.8	0.6

## IV. Indexes and Public Policy

The current Congressional debate on the Federal budget has focussed attention on the role of indexation in increasing expenditures. By linking increases in certain spending categories to changes in the cost of living, Congress originally sought to assure that benefit recipients would be able to cope with increases in the cost of living without further Congressional action. In other words, recipients of Federal payments would almost automatically preserve their "real" income. Payments to individuals account for more than half of Federal-budget expenditures, and 90 percent of such programs are indexed. Thus, nearly two-fifths of Federal budget outlays, whether paid out as wages or transfer payments, are linked to a price index (Table 3).

In the case of social-security benefits, Congress ironically adopted an escalator approach as a means of capping the extraordinarily generous benefits it had adopted in the early 1970s. (Between 1970 and 1974, benefits

increased by about 70 percent — just about double the increase in the cost of living.) The current indexation formula essentially provides for a benefit adjustment equal to the annual percentage increase in the CPI (first-quarter to first-quarter). The benefit formula thus called for a 14.3-percent increase in July 1980 and an 11.2-percent increase in July 1981. If the cost of living had been measured by the PCE instead, the increase in benefits would have amounted to 8.2 percent in 1980 and to about 9.4 percent in 1981.

Congress recently has begun to consider several less costly indexing alternatives. One of these would delay the first payment of increased benefits from July to October each year. This lag would lessen the extent of overstatement of the previous year's inflation rate if inflation were accelerating, but it would worsen the overstatement if inflation were decelerating. Another suggestion would peg the increase in benefits to the increase in either the CPI or average wages, whichever is smaller. Still another suggestion would put an 85-percent "cap" or ceiling on the increase in the CPI.

According to the General Accounting Office, inflation accounted for approximately half of the increase in expenditures for indexed programs over the 1970-77 period. The GAO study indicated that such spending increases automatically by \$15-25 billion at a 10-percent inflation rate, and increases by \$1.5 billion to \$2.5 billion more for each additional percentage point of measured inflation. If the PCE index had been used in place of the CPI during the 1970-77 period, roughly 11½ percent (\$12.5 billion) of the cumulative spending increase could have been saved.

A Congressional Budget Office study argued that CPI-based indexation could account for three-fourths of a \$200-billion increase in Federal payments to individuals projected for the 1980-85 period. But again, a shift from the CPI to the PCE index could mean savings of \$11 billion through 1986 for the social-security program alone.<sup>11</sup>

**Table 3**  
**Major Indexed Programs**

	Outlays, FY 1980 (billions)
<b>Directly indexed</b>	
Social security	\$117.1
Supplemental security income	6.4
Railroad retirement	4.7
Veterans' pensions	3.6
Civilian retirement and disability	14.7
Military retirement	11.9
Black lung	1.8
Food and nutrition assistance	<u>13.3</u>
Subtotal, directly indexed	\$173.5
As percent of total outlays	29.9%
<b>Indirectly indexed</b>	
Medicare	\$ 35.0
Medicaid	<u>14.0</u>
Subtotal, indirectly indexed	\$ 49.0
As percent of total outlays	8.5%
<b>Total indexed programs</b>	
Total outlays	<u>\$222.5</u>
As percent of total outlays	38.4%

Source: Office of Management and Budget, American Council of Life Insurance.

## Compensation and Equity

When indexation overcompensates for inflation, questions of equity arise. Federal payments to individuals are made only to certain individuals, while taxpayers who pay for such benefits may be falling behind the increase in living costs. The cost-of-living adjustments (COLAs) that are written into many labor contracts are generally capped, so that workers fail to receive full compensation for their higher living costs (Table 4). And those whose income is not indexed at all may fall even further behind.

Increases in social-security benefits have been tied to the CPI since 1975. From 1976 through 1978, the yearly increase in wages exceeded the annual indexed increase in social-security benefits. However, the difference was smaller than indicated, because social-security benefits are not taxed as wages are. When annual CPI increases ran ahead of wage increases, from 1979 through 1981, the

**Table 4**  
**Annual Change in**  
**the CPI, PCE and**  
**Average Wages\***  
**(percent)**

	<b>CPI</b>	<b>PCE</b>	<b>Average Wages</b>
1975/76	6.4	5.7	7.2
1976/77	5.8	5.3	7.7
1977/78	6.6	6.3	7.7
1978/79	9.8	9.1	8.3
1979/80	14.3	8.2	8.4
1980/81	<u>11.2</u>	<u>9.4</u>	<u>9.8</u>
Annual Average	9.0	7.3	8.2

\*First quarter to first quarter

taxability factor made the gap even wider. In contrast, the PCE index — though rising more slowly than wages — would have placed wage earners and benefit recipients on a reasonably equitable basis during this period.

## V. Summary and Conclusions

Many analysts have used the term “inflation” rather loosely in describing the recent sharp rises in prices of certain individual commodities, such as oil and food. Nonetheless, the inflationary process primarily involves an increase in the *general* price level. Within this context, the *relative* prices of individual goods may rise or fall according to market forces. Since numerous goods and services are bought and sold daily in the markets, an index number represents the only feasible method of describing the general movement of prices through time.

An index number designed to measure inflation should give an accurate representation of changes in living costs. The true cost of living cannot be measured directly, since it is a matter of personal satisfaction or well-being. However, it can be measured indirectly by market observations as consumers reveal their individual preferences by purchasing certain goods and services. The Consumer Price Index

has long been used as the common indicator of the cost of living, and thus as a basis for indexing cost-of-living adjustments.

The CPI, as a Laspeyres index, uses quantities purchased in a certain base year as a reference point from which to measure changes in prices of a basic — presumably unchanging — consumer-expenditure pattern. The unchanging nature of the base-year consumption pattern ignores substitution of less expensive for more expensive goods in the reference expenditure package as relative prices change in succeeding periods. This imparts an upward bias to the index, as the increasingly expensive base-period expenditure pattern (in current prices) overstates what consumers actually bought and paid for at the checkout counter.

The Personal Consumption Expenditure index (or deflator) has come to be used as an alternative index, although it was not specifically designed to measure changes in the

cost of living. The PCE, as a Paasche index, uses the current-period expenditure pattern as a reference base for comparison with expenditures in earlier periods. This approach thus allows for substitution of goods in the expenditure pattern. However, when that pattern is projected backward from the current year, the substitute goods of the current period may not have been as desirable to consumers in earlier periods. The consumer's loss of satisfaction, relative to the current period, thus causes a PCE (Paasche) index to understate changes in the "true" cost of living.

As a practical matter, the CPI and the PCE were quite close in their measurement of living costs from 1960 through 1966. But from 1978 through 1980, the CPI rose at a much faster rate. This disparity resulted not so much from the indexes' different statistical composition as from their different treatment of sharply rising homeownership costs. The housing component of the CPI overstated the inflation in housing costs, because it included the full cost of a house, which includes its value as an asset, rather than merely the cost of shelter services. The treatment of mortgage interest also contributed to this overweighting of the costs of

homeownership.

The Federal government uses the CPI as a standard index in its efforts to offset the impact of inflation on benefits paid to individuals. But since individuals receive roughly half of all total budget outlays, and since 90 percent of these payments contain a cost-of-living adjustment, the indexing formula should measure living costs as closely as possible. In the past several years, most evidence has suggested that the use of the CPI overcompensates benefit recipients.

This overcompensation has raised two public-policy questions. First, overcompensation leads to unwarranted increases in Federal expenditures and in the Treasury deficit. Beyond that, it introduces inequities relative to those individuals not receiving indexed benefits, and thus amounts to an unintended redistribution of income. Indexed transfer payments are not taxable, and this widens the gap between benefit increases and wage increases. A comparison of index movements since the Federal government's widespread adoption of indexing suggests that the PCE index is a more equitable choice for determining cost-of-living adjustments.

#### FOOTNOTES

1. Allen, R.D.G., *Index Numbers in Theory and Practice*, Aldine: Chicago, 1975.

2. Klein, Lawrence and Rubin, Alan, "A Constant Utility Index of the Cost of Living", *The Review of Economic Studies*, 1949, p. 84.

3. Houthakker, Hendrik, "Compensated Changes in Quantities and Qualities Consumed", *The Review of Economic Studies*, Vol. XIX, no. 50, 1952-53, pp. 156-159.

4. Consumer substitution with a Laspeyres index can make a difference between the measured cost of living and the "true" or perceived change in the cost of living as measured by an index. A number of studies have indicated that the amount of error involved increases rapidly with the rate of inflation. Nicholas N. Noe and George von Furstenburg, ("The Upward Bias in the Consumer Price Index due to Substitution", *Journal of Political Economy*, November/December 1972, Vol. 80, p. 1283) found the percentage error in the CPI due to substitution to be "trivial" in the 1963-

70 period. However, an examination of their results indicates a steady increase in the percentage error from 1964 (when the CPI rose by 1.2 percent) to 1970 (when it rose by 6.1 percent). For a class of 20 expenditure categories, the percentage error increased from 0.005 to 0.326, or at a compound annual rate of 100.6 percent — more than three times the annual rate of increase in the CPI in this period. Steven D. Braitwait, ("The Substitution Bias of the Laspeyres Price Index", *The American Economic Review*, March 1980, vol. 70, no. 1, p. 71), using 1958-70 data, found that the substitution bias increased significantly the longer that weights were held constant, rising from 0.36 for the 1958-63 period to 1.5 for the 1958-73 period. As Braitwait points out, relative prices change more in a high-inflation period than in a low-inflation period. His index of relative price dispersion increased from .11 in 1956-63 to 3.5 in 1958-73. And it is this dispersion of relative prices that affords greater opportunity for commodity substitution. Alan S. Blinder ("The Consumer Price Index and the Measurement of Recent Inflation",

*Brookings Papers on Economic Activity*, 1980:2, p. 545.) found that differences in weighting accounted for about one-half of the difference between the CPI and PCE in 1979. Indeed, the post-1978 period, an almost continuous period of high inflation, "has been one of those rare times in which substantial differences between the Laspeyres and Paasche indexes are expected to arise."

5. Blinder, Alan S., "The Consumer Price Index and the Measurement of Recent Inflation", *Brookings Papers on Economic Activity*, No. 2, 1980, p. 542.

6. "Fixed Nonresidential and Residential Capital in the United States, 1925-1975", U.S. Department of Commerce, Washington, June 1976, pp. T-6, T-7.

7. U.S. Department of Labor, Bureau of Labor Statistics, Consumer Expenditure Survey: Interview Survey, 1972-73, Bulletin 1997, U.S. Government Printing Office, 1978 and Consumer Expenditure Survey: Diary Survey, July 1972-June 1974, Government Printing Office, 1977.

8. The PCE is not a perfect Paasche index in the theoretical sense, because it cannot follow every price for the commodities and services that it covers. The Bureau of Economic Affairs combines the 107 personal-consumption categories, expressed in nominal dollars, into 70 categories which are

expressed in 1972 dollars. The prices used are largely CPI prices. For example, the rental index in the CPI is used as the basis for calculating the imputed rent of owner-occupied dwellings. "Reconciliation of Quarterly Changes in Measures of Prices Paid by Consumers", *Survey of Current Business*, March 1978, p. 6.

9. The PCE deflator treats housing as a service of an asset rather than as the purchase cost of an asset, as in the CPI, but both indexes treat autos and other consumer durables as a first-time purchase rather than as the use of a current service. However, the use of service value rather than durable-goods purchase price does not seem to have altered the PCE deflator's behavior to any significant degree in the 1947-77 period. Katz, Arnold J. and Peskin, Janice, "The Value of Services Provided by the Stock of Consumer Durables, 1947-1977; An Opportunity Cost Measure", *Survey of Current Business*, July 1980, p. 22

10. "An Analysis of the Effects of Indexing for Inflation on Federal Expenditures," General Accounting Office, August 15, 1979, p. 40.

11. "Reducing the Federal Budget: Strategies and Examples", Congressional Budget Office, February 1981, p. 145.

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