# Regional Hospital Input Price Indexes

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*This paper describes the development of regional hospital input price indexes that is consistent with the general methodology used for the National Hospital Input Price Index. The feasibility of developing regional indexes was investigated because individuals inquired whether different regions experienced different rates of increase in hospital input prices. The regional indexes incorporate variations in cost-share weights (the amount an expense category contributes to total spending) associated with hospital type and location, and variations in the rate of input price increases for various regions.*

*We found that between 1972 and 1979 none of the regional price indexes increased at average annual rates significantly different from the national rate. For the more recent period 1977 through 1979, the increase in one Census Region was significantly below the national rate. Further analyses indicated that variations in cost-share weights for various types of hospitals produced no substantial variations in the regional price indexes relative to the national index.*

*We consider these findings preliminary because of limitations in the availability of current, relevant, and reliable data, especially for local area wage rate increases.*

## Introduction

Much attention has been given to the increase in hospital costs during the past decade. Hospital costs may be viewed as the product of the prices hospitals pay for goods and services and the quantity of goods and services purchased. This paper focuses on how the prices have changed for the goods and services hospitals use to provide patients with care.

Input price indexes are designed to separate the effects of price inflation from other causes of growth in expenditures. A hospital-specific index is necessary because hospitals produce their "outputs" with a mix of labor, capital, energy, and raw materials that differs from other industries. The use of general indexes such as the all items Consumer Price Index (CPI), the CPI hospital room rate, the Producer Price Index, or the Gross National Product (GNP) Implicit Price Deflator as proxies for a hospital-specific input price index may misrepresent the increases in prices of goods and services used in hospitals (Stockman and Gramm, 1980). For this reason, we developed a hospital-specific index, the National Hospital Input Price Index (NHIPI) (Freeland, Anderson, and Schendler, 1979).

The NHIPI is constructed from price proxies for goods and services that hospitals purchase, each weighted by the proportion or cost share that the item contributes to the total purchases of hospitals. To obtain an index for all hospital costs, we summed the product of cost-shares and prices across all items. In the NHIPI, both the cost-shares and the price increase information are drawn from national data.

The Department of Health and Human Services currently uses a national input price index as one determinant in establishing prospective reimbursement limits for routine hospital services (Health Care Financing Administration, 1981). Some State rate-setting programs use forecasts of the national index to assist in establishing prospective limits for hospital budgets. The Omnibus Budget Reconciliation Act of 1981 (House of Representatives, 1981) suggests that States may want to use a hospital input price index as one determinant of hospital reimbursement rates under Medicaid. Hospital administrators use forecasts of the index to assist in the budgeting process.

Users of the national input price index inquired whether the prices and cost shares of the goods and services that hospitals use vary from the national index.

both by the hospital's geographic location and by the type of hospital. Some States and hospital administrators preferred an index that was specific to their region or hospital type. Our response to these concerns was to construct preliminary hospital input price indexes that are specific to both geographic areas of the country and to various characteristics of hospitals such as the number of beds, urban or rural location, and the presence of training programs for medical interns and residents. By constructing these regional indexes, we are able to approximate the regional variation in input price inflation relative to price increases for the nation as a whole.

While this study builds on other models of hospital input prices (Feldstein, 1974; Gort, *et al.*, 1975; Harbridge House, Inc., 1978; Phillip *et al.*, 1976, and Rossman, *et al.*, 1980), it is the only study that covers all geographic areas, is current, and has equations that have been estimated so that forecasts of the regional prices can be made (Data Resources, Inc., 1980; Data Resources, Inc., 1981).

This paper describes the method for constructing these area indexes, highlights the rates of growth of the various indexes, and suggests areas requiring further work.

## Development of Regional Hospital Input Price Indexes

This section discusses the construction of the geographic indexes of hospital input prices. We developed indexes for each Census Division (Appendix A) and hospital type (Appendix B). We chose Census Divisions as a geographic unit primarily because of the relatively homogeneous economic activity within the Division and the availability of related economic data for the Divisions. Specific categories of hospital types are those used by the Health Care Financing Administration to set limits on hospital inpatient general routine operating costs under the Section 223 Medicare regulations (Health Care Financing Administration, 1981).[1]

For each Census Division, we constructed a Laspeyres index (fixed baseweight) for hospital input prices that shows how much hospitals pay in the current period to purchase the same mix of resource inputs that were purchased in the base period (Wallace and Cullison, 1979). This index has two components: 1.) price proxies for the rates of price inflation for each of the resource inputs, and 2.) relative weights, referred to as cost shares, reflecting how much of each input was used.

Price proxies were selected from either regional or national price data, depending on whether hospitals purchased inputs in regional or national markets (Data Resources, Inc., 1980). Price proxies with regional variation are used for three-fourths of the expenses as measured by cost shares (Table 1). However in some instances, we were constrained by the lack of current, relevant, and reliable geographic price data. As Table 1 shows, price proxies from each of the Census Divisions were used for eight categories of inputs. National data were used for 13 price proxies. Two price proxies were drawn from the broader four Census Regions (Northeast, North Central, South, and West) because adequate and timely data from the Census Divisions were not available. For example, the price proxy used for estimating payroll expenses, average hourly earnings of private hospital workers collected by the Bureau of Labor Statistics, is available only for the four Census Regions. However, it is the only timely Federally collected source of hospital average hourly earnings data.

Cost shares for six major expense categories for each Census Division and for the hospital classification categories within each Division were obtained from the American Hospital Association's Annual Survey data for 1977. Thus, the cost share weights for the regional input price index are consistent with the 1977 cost share weights in the National Hospital Input Price Index (Freeland, Anderson, and Schendler, 1979). The six cost categories are payroll expenses, employee benefits, professional fees, depreciation, interest, and all other expenses (Table 2).

Payroll expense and employee benefit weights for each Census Division and each hospital classification within each Census Division were taken directly from the AHA Survey. Cost share weights for the other twenty-one expense categories in Table 1 were distributed to the four other AHA major expense categories using either the national index weights (malpractice insurance, diet and cafeteria, and fuel and energy) or the subcategory expense weights in the same proportion as the national weights for the same items (Freeland, Anderson, and Schendler, 1979).

In the following three sections we will discuss our findings on regional variations in cost shares and in the two major sets of price proxies that comprise the price component of the regional input price indexes: wages and non-wage prices.

[1]One exception is that the Section 223 regulations do not have "teaching/nonteaching" hospitals as separate categories. Instead, a special adjustment is made for the costs associated with education (Health Care Financing Administration, 1981).

**TABLE 1**
**Regional Hospital Input Price Index: Expense Categories, Relative Weights, Price Proxies, and Number of Regions Associated with Each Price Proxy**

| Expense Category | National Relative Weight, 1977 | Price Proxy[1] | Number of Regions Associated with Price Proxy |
|---|---|---|---|
| 1. Payroll Expenses (Wages and Salaries) | 51.69 | Average hourly earnings of private hospital industry workers (SIC 806), Bureau of Labor Statistics (BLS)[2] | 4 |
| 2. Employee Benefits | 7.22 | Supplements to wages and salaries per employee in nonagricultural establishments, Bureau of Economic Analysis (BEA) and BLS | 9 |
| 3. Professional Fees: Medical | 4.46 | Consumer Price Index (CPI) for physicians' services, BLS | 1 |
| 4. Professional Fees: Other (legal, auditing, consulting, etc.) | 0.52 | Employment Cost Index, all private nonfarm workers, BLS[3] | 4 |
| 5. Depreciation: Building and Fixed Equipment | 2.58 | Implicit price deflator, investment, private nonresidential structures (5-year quarterly moving average, lagged), (BEA) | 1 |
| 6. Depreciation: Movable Equipment | 1.43 | Implicit price deflator, investment, private nonresidential producers' durable equipment (5-year quarterly moving average, lagged, (BEA) | 1 |
| 7. Interest: Working Capital | 0.41 | Prime rate on short-term business loans (4-quarter moving average, lagged) (Federal Reserve) | 1 |
| 8. Interest: Capital Debt | 1.60 | Yield on domestic municipal bonds (5-year quarterly moving average, lagged) (Daily Bond Buyer) | 1 |
| 9. Hospital Professional Liability (Malpractice) Insurance Premiums | 2.00 | Hospital professional liability (malpractice) insurance premiums, American Hospital Association | 1 |
| 10. Food: Purchases at Early Stages of Distribution | 1.57 | Producer Price Index (PPI) processed foods and feeds (BLS) | 1 |
| 11. Food: Purchases at Later Stages of Distribution | 1.57 | CPI food at home (BLS) | 9[4] |
| 12. Fuel Oil and Coal | 0.94 | Price per barrel of number 2 fuel oil (average delivered prices of fuel oil at steam-electric plants), Energy Information Administration | 9 |
| 13. Electricity | 0.67 | PPI commercial electric power, 40 KW demand (BLS) | 9 |
| 14. Natural Gas | 0.50 | End user price of natural gas, commercial sector, American Gas Association | 9 |
| 15. Water and Sanitary Services | 0.31 | CPI water and sewerage maintenance (BLS) | 1 |
| 16. Drugs | 2.48 | PPI pharmaceutical preparations, ethical (BLS) | 1 |

(Continued)

**TABLE 1 (Continued)**
**Regional Hospital Input Price Index: Expense Categories, Relative Weights, Price Proxies, and Number of Regions Associated with Each Price Proxy**

| Expense Category | National Relative Weight, 1977 | Price Proxy[1] | Number of Regions Associated with Price Proxy |
|---|---|---|---|
| 17. Chemicals and Cleaning Products | 1.88 | PPI chemicals and allied products (BLS) | 1 |
| 18. Surgical and Medical Instruments and Supplies | 1.78 | PPI special industry machinery and equipment (BLS) | 1 |
| 19. Rubber and Miscellaneous Plastics | 1.62 | PPI rubber and plastic products (BLS) | 1 |
| 20. Business Travel and Motor Freight | 1.51 | CPI private transportation (BLS) | 9[4] |
| 21. Apparel and Textiles | 1.45 | PPI textile products and apparel (BLS) | 1 |
| 22. Business Services | 4.12 | CPI services less medical care (BLS) | 9[4] |
| 23. All Other Miscellaneous Expenses | 7.70 | CPI all items (BLS) | 9[4] |
| Total | 100.00 | | |

[1] For more complete descriptions of price proxies see Data Resources, Inc., (1980); Freeland, Anderson, and Schendler (1979); and Health Care Financing Administration (1981).

[2] Average hourly earnings data for the nation are published in monthly issues of Bureau of Labor Statistics, *Employment and Earnings*, Table C-2. Unpublished data for the four Census Regions were furnished through the courtesy of the Bureau of Labor Statistics for purposes of research. These unpublished data are not available prior to 1972 and do not meet Bureau of Labor Statistics publication standards for reliability.

[3] The Employment Cost Index (ECI) has been available since the third quarter of 1975. Data Resources, Inc. simulated ECI values for the period 1972:1 to 1975:2. See Data Resources, Inc. (1980).

[4] Consumer Price Indexes (CPI's) for the nine Census Divisions are weighted averages of CPI's for standard metropolitan statistical areas within the Census Divisions. See Data Resources, Inc. (1980).

**TABLE 2**
**Relative Weights for Six Expense Categories, Nine Census Divisions, 1977[1]**

| | Expense Category | | | | | | |
|---|---|---|---|---|---|---|---|
| Census Division | Wages and Salaries | Employee Benefits | Professional Fees | Depreciation | Interest | Other | Total |
| U.S. National | 51.7% | 7.3% | 4.9% | 4.0% | 2.0% | 30.1 | 100.0% |
| Northeast Region | | | | | | | |
| New England | 54.3 | 7.9 | 3.3 | 4.0 | 1.8 | 28.8 | 100.0 |
| Middle Atlantic | 55.3 | 8.3 | 3.3 | 3.6 | 1.6 | 27.9 | 100.0 |
| North Central Region | | | | | | | |
| East North Central | 53.4 | 7.4 | 4.4 | 4.2 | 2.0 | 28.7 | 100.0 |
| West North Central | 51.8 | 6.3 | 5.0 | 4.5 | 2.2 | 30.2 | 100.0 |
| South Region | | | | | | | |
| South Atlantic | 49.8 | 6.6 | 5.3 | 4.2 | 1.9 | 32.3 | 100.0 |
| East South Central | 48.5 | 6.1 | 5.7 | 4.1 | 1.9 | 33.6 | 100.0 |
| West South Central | 48.2 | 5.5 | 5.5 | 4.3 | 2.6 | 33.9 | 100.0 |
| West Region | | | | | | | |
| Mountain | 50.3 | 6.5 | 6.1 | 4.0 | 2.0 | 31.2 | 100.0 |
| Pacific | 48.5 | 8.2 | 7.6 | 3.7 | 2.3 | 29.7 | 100.0 |

[1] American Hospital Association, Annual Survey, Medicare-Certified Community Hospitals, 1977.

## Variation in Cost-Share Weights

Cost-share weights reflect the relative quantities of labor and non-labor inputs that are purchased and the prices that are paid for these inputs. The share of the total budget that is allocated to particular items of expense is determined by the managerial objectives, outputs, technological processes, external economic conditions such as area wage rates, and economic incentives relating to third party payments. Labor-related costs comprise nearly two-thirds of total cost shares nationally, of which wages and salaries comprise 52 percent; employee benefits, 7 percent; and professional fees, 5 percent (Tables 1 and 2). Non-labor costs comprise a third of total costs, with depreciation and interest accounting for 4 percent and 2 percent, respectively, (Table 2); all other inputs such as drugs, surgical supplies, food, utilities, and so forth, account for 30 percent (Table 1).

We found that cost shares vary by Census Division and by hospital type. For example, wage and salary expenses in the West South Central area have a cost share of 48.2 percent, compared with 55.3 percent in the Middle Atlantic Division (Table 2 and Figure 1). We also observed cost share differences for the various hospital types (Figure 2). In general, large, teaching hospitals in Standard Metropolitan Statistical Areas (SMSA's) had large wage and fringe benefit cost shares. This pattern may reflect higher wage levels in SMSA's (Health Care Financing Administration, 1981) and differences in the skill mix of employees. Smaller nonteaching hospitals in both SMSA's and non-SMSA's had larger cost shares for professional fees.

## Regional Variation in Hospital Wage Rate Increases

Since wages are a major part of total cost, rates of change in wages significantly affect rates of change in total input price indexes. Wage data from the Bureau of Labor Statistics (BLS) show that for the period 1973 through 1979 average hourly earnings of non-supervisory workers in private hospitals increased at an average annual rate of 7.9 percent for the nation (Table 3).[2] The Northeast had the lowest average annual rate of increase for this period, 6.9 percent, and the West had the highest increase, 8.7 percent. The North Central and South regions were intermediate, with average annual increases of 8.3 percent and 8.5 percent, respectively. The relatively lower wage rate increases in the Northeast may, in part, reflect the efforts of hospital rate-setting programs by States in the Northeast Region.[3] This lower rate of increase may also reflect shifts in population and industry from the Northeast to the South and West. Likewise, the relatively higher increases for the South and West may be associated with the growth in employment and industry in these regions. Increases in the minimum wage are a particularly important source of cost-push pressure in the South (Data Resources, Inc., 1980) which has the lowest "wage rate" level of the four regions (Tables 4 and 5). The Northeast and the West have the highest "wage" levels (Tables 4 and 5). The West has the highest rate of unionization among hospital employees (Feldman, Lee, and Hoffbeck, 1980); however, we have not analyzed the relative contribution of unionization to wage levels and rates of change. Regional rates of wage increases from the American Hospital Association's (AHA) Annual Survey are generally consistent with the BLS data.

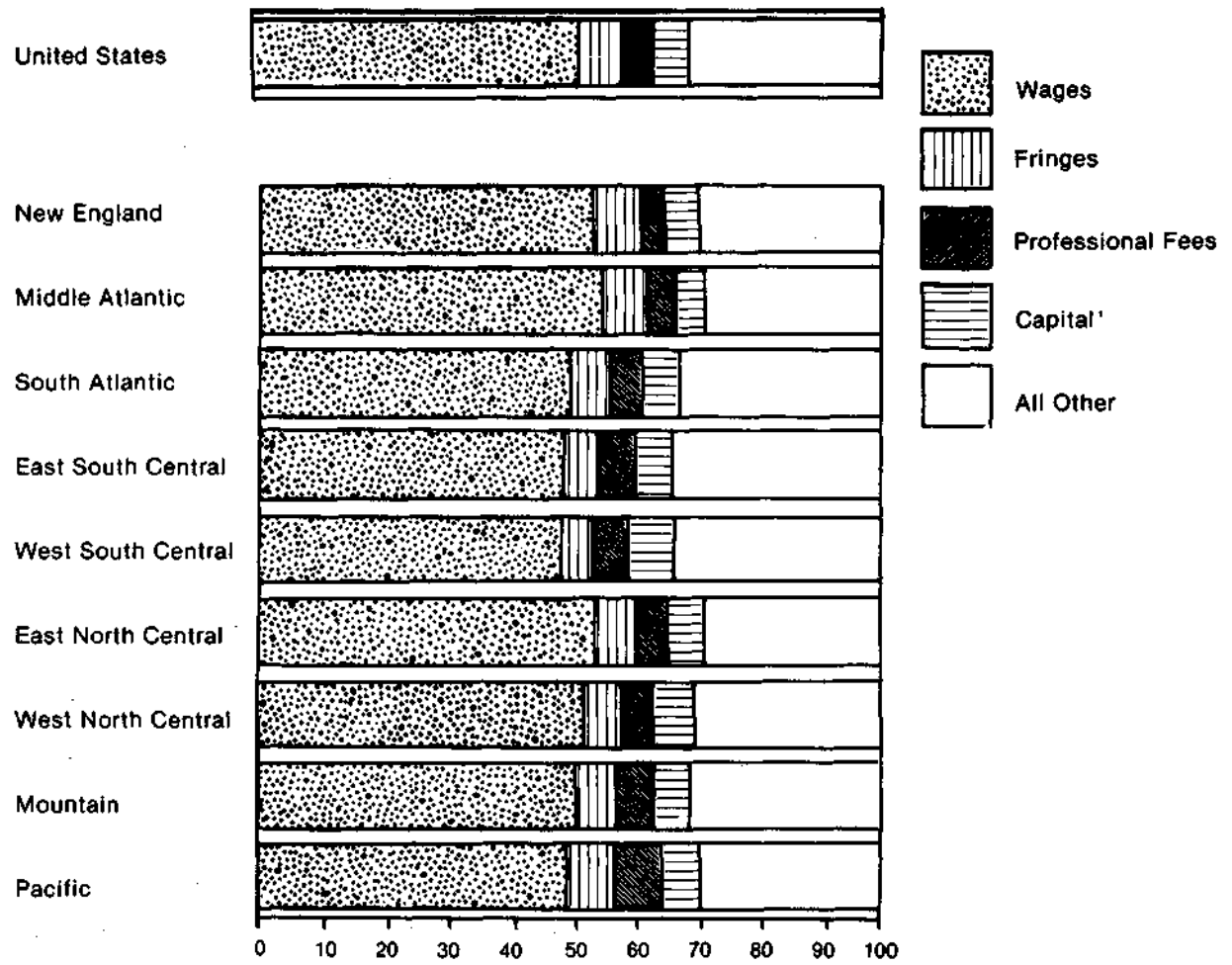
Table 4 displays average annual rates of increase for 1972 through 1979 for three hospital "wage rate" series: average hourly earnings of non-supervisory workers in private hospitals (BLS), payroll expenses per full-time equivalent hospital worker in private community hospitals (AHA), and payroll expenses per full-time equivalent hospital worker in all community hospitals (AHA). For the nation as a whole, average hourly earnings increased at an annual average rate of 7.9 percent in the BLS series and at a rate of 7.7 percent for the two AHA "wage" series. The AHA data indicate less variation across the four Census Regions in the average annual rates of increase. Both the BLS and AHA series indicate that the Northeast had the lowest average annual rate of increase for the period 1972 through 1979. The AHA series indicate that increases were relatively uniform across the other three Census Regions, whereas the BLS series indicates that the South and West may have increased at average annual rates slightly faster than for the North Central Region. We have not ascertained the extent to which these differences represent sampling variability, differences in the hospital universes covered, differences in definitions used to calculate "wage rates," differences in methods used to impute missing data, errors in the data, and the use of calendar year data in the BLS series and hospital fiscal year data in the AHA series. Based on the AHA data in Table 5 there are relatively uniform average annual rates of increase in "wage rates" for Census Divisions within the four Census Regions.[4]

[2] The percent change in this "wage" variable deviates from a pure price change in that it includes the effects of skill mix shifts and overtime pay. Currently, data do not exist on a continuing basis to statistically control for the above effects.

[3] For a description of these rate setting programs, see Biles *et al.*, (1980) and "To the Editor..." (1981).

[4] Of course, relatively uniform wage rate increases within a Census Region do not preclude wide variation in wage rate increases for local market areas or for individual hospitals. Such variation is beyond the scope of this paper.

**FIGURE 1**
**Distribution of Cost Shares for Census Divisions, 1977**

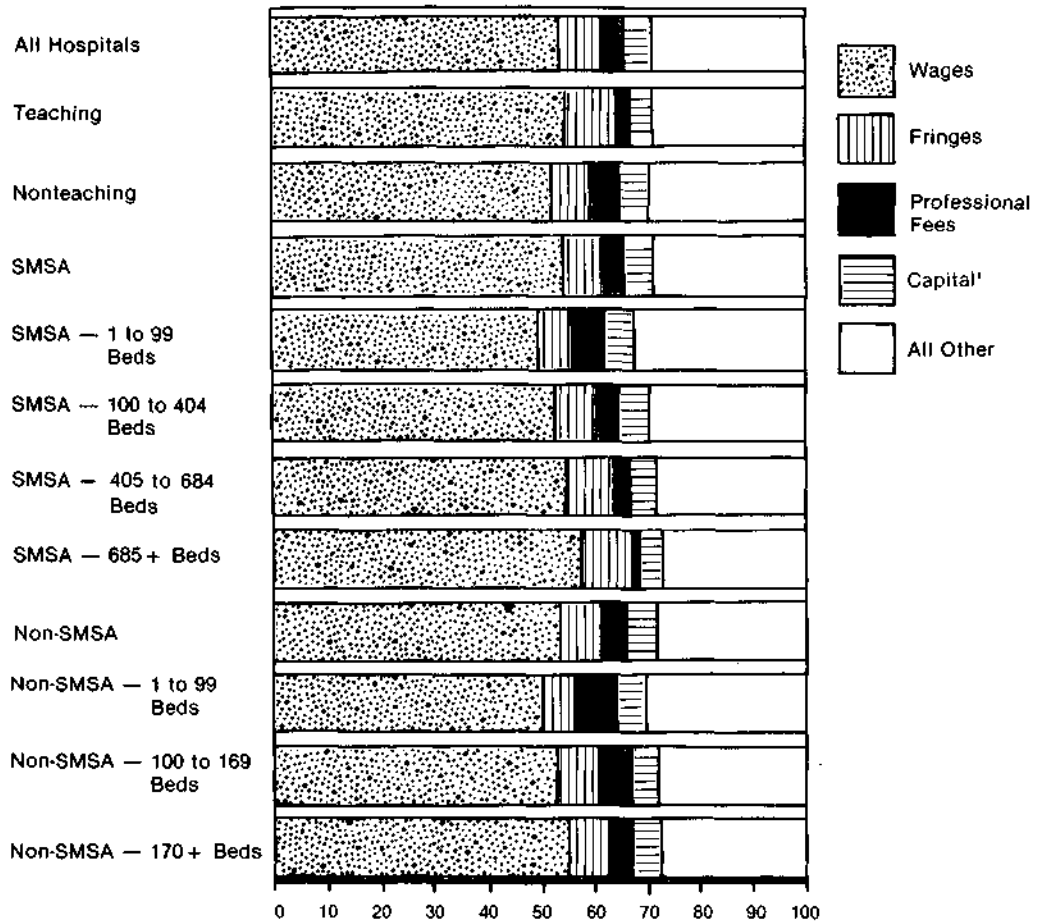



| | Wages | Fringes | Professional Fees | Capital | All Other | Total |
|---|---|---|---|---|---|---|
| United States | 51.74 | 7.27 | 4.92 | 5.99 | 30.08 | 100.00 |
| New England | 54.31 | 7.89 | 3.27 | 5.76 | 28.77 | 100.00 |
| Middle Atlantic | 55.25 | 8.31 | 3.30 | 5.24 | 27.90 | 100.00 |
| South Atlantic | 49.84 | 6.57 | 5.28 | 6.02 | 32.29 | 100.00 |
| East South Central | 48.52 | 6.13 | 5.68 | 6.03 | 33.64 | 100.00 |
| West South Central | 48.21 | 5.53 | 5.51 | 6.90 | 33.85 | 100.00 |
| East North Central | 53.35 | 7.37 | 4.44 | 6.18 | 28.66 | 100.00 |
| West North Central | 51.76 | 6.33 | 5.01 | 6.69 | 30.21 | 100.00 |
| Mountain | 50.30 | 6.45 | 6.06 | 6.00 | 31.19 | 100.00 |
| Pacific | 48.46 | 8.21 | 7.59 | 6.00 | 29.74 | 100.00 |

Source: American Hospital Association, Medicare-Certified Community Hospitals. Compiled by Office of Research, Demonstrations, and Statistics, HCFA.

' Capital includes depreciation and interest.

**FIGURE 2**
**Distribution of Cost Shares by Hospital Classification**
**Middle Atlantic Census Division, 1977**




| | Wages | Fringes | Professional Fees | Capital' | All Other | Total |
|---|---|---|---|---|---|---|
| All Hospitals | 55.25 | 8.31 | 3.30 | 5.24 | 27.90 | 100.00 |
| Teaching | 56.22 | 8.76 | 2.48 | 5.04 | 27.50 | 100.00 |
| Nonteaching | 52.99 | 7.26 | 5.23 | 5.67 | 28.85 | 100.00 |
| SMSA | 55.36 | 8.38 | 3.16 | 5.21 | 27.89 | 100.00 |
| SMSA 1 to 99 Beds | 50.39 | 6.53 | 6.23 | 5.05 | 31.80 | 100.00 |
| SMSA 100 to 404 Beds | 53.57 | 7.77 | 4.29 | 5.60 | 28.77 | 100.00 |
| SMSA 405 to 684 Beds | 55.66 | 8.53 | 2.98 | 5.29 | 27.54 | 100.00 |
| SMSA 685 + Beds | 58.39 | 9.39 | 1.22 | 4.36 | 26.64 | 100.00 |
| Non-SMSA | 54.04 | 7.50 | 4.89 | 5.57 | 28.00 | 100.00 |
| Non-SMSA 1 to 99 Beds | 50.43 | 6.14 | 7.58 | 5.43 | 30.42 | 100.00 |
| Non-SMSA 100 to 169 Beds | 53.19 | 7.90 | 6.03 | 5.15 | 27.73 | 100.00 |
| Non-SMSA 170 + Beds | 55.21 | 7.66 | 3.81 | 5.76 | 27.56 | 100.00 |

Source: American Hospital Association, Medicare-Certified Community Hospitals. Compiled by Office of Research, Demonstrations, and Statistics, HCFA.

'Capital includes depreciation and interest.

**TABLE 3**
**Annual Percent Changes in Selected Regional Wage Series, 1973-1979**

| | Average Hourly Earnings of Non-supervisory Workers in Private Hospitals, BLS[1,2] | | | | | Employment Cost Index All Private Nonfarm Workers, BLS[3] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Calendar Year | U.S. Total | Northeast | North Central | South | West | U.S Total | Northeast | North Central | South | West |
| 1973 | 5.6% | 5.1% | 5.1% | 5.1% | 6.5% | NA | NA | NA | NA | NA |
| 1974 | 7.6 | 7.5 | 8.3 | 9.1 | 6.8 | NA | NA | NA | NA | NA |
| 1975 | 9.8 | 12.0 | 8.7 | 8.8 | 10.4 | NA | NA | NA | NA | NA |
| 1976 | 8.2 | 6.2 | 9.9 | 9.0 | 8.6 | NA | NA | NA | NA | NA |
| 1977 | 7.1 | 5.2 | 7.4 | 7.7 | 9,4 | 7.0% | 6.9% | 6.7% | 6.7% | 7.3% |
| 1978 | 8.4 | 6.1 | 9.6 | 9.4 | 9.2 | 7.7 | 7.0 | 7.6 | 8.9 | 7.7 |
| 1979 | 8.5 | 5.8 | 9.2 | 10.2 | 9.7 | 8.0 | 7.0 | 8.2 | 8.5 | 8.1 |
| Selected Periods | Two Year Average Percent Changes | | | | | | | | | |
| 1973-1974 | 6.6 | 6.5 | 6.7 | 7.1 | 6.7 | NA | NA | NA | NA | NA |
| 1974-1975 | 8.7 | 9.8 | 8.5 | 9.0 | 8.6 | NA | NA | NA | NA | NA |
| 1975-1976 | 9.0 | 9.1 | 9.3 | 8.9 | 9.5 | NA | NA | NA | NA | NA |
| 1976-1977 | 7.7 | 5.7 | 8.7 | 8.4 | 9.0 | NA | NA | NA | NA | NA |
| 1977-1978 | 7.8 | 5.7 | 8.5 | 8.6 | 9.3 | 7.4 | 7.0 | 7.2 | 7.8 | 7.5 |
| 1978-1979 | 8.5 | 6.0 | 9.4 | 9.8 | 9.5 | 7.9 | 7.0 | 7.9 | 8.7 | 7.9 |
| | Multiple-Year Average Percent Changes | | | | | | | | | |
| 1973-1979 | 7.9 | 6.9 | 8.3 | 8.5 | 8.7 | NA | NA | NA | NA | NA |
| 1977-1979 | 8.0 | 5.7 | 8.7 | 9.1 | 9.4 | 7.6 | 7.0 | 7.5 | 8.0 | 7.7 |

NA = Not available.
[1]Used as price proxy variable for "wages and salaries" expense category.
[2]Average hourly earnings data for the nation are published in monthly issues of Bureau of Labor Statistics, *Employment and Earnings*, Table C-2. Unpublished data for the four Census Regions were furnished through the courtesy of the Bureau of Labor Statistics for purposes of research. These unpublished data are not available prior to 1972 and do not meet Bureau of Labor Statistics publication standards for reliability.
[3]Bureau of Labor Statistics, *Current Wage Developments*, Table 9.

From 1973 through 1979, none of the four Census Regions differed significantly from the national average in the mean annual percent increases in average hourly earnings of non-supervisory workers in private hospitals (BLS), (Table 6). The relatively uniform increases across Census Regions and Divisions for the AHA data (Tables 4 and 5) tend to confirm the statistical findings of the BLS data (Table 6). Also, during the period 1973 through 1979 the correlation of annual regional hospital wage rate percent increases to the national percent increases varied from .70 in the Northeast Region to .81 in the North Central Region. All correlations were significantly different from zero at the .05 level of significance or higher (Table 6).

For the three year period 1977 through 1979, hospital wage rates increased at significantly lower annual rates in the Northeast Region than for the United States in general, and hospital wage rates in the West increased at annual rates significantly faster than the national rate. The lower rates of increase in the Northeast may, in part, reflect the effect of hospital rate setting programs on wage rate increases rather than the effects of competitive market forces alone.

We compared changes in regional hospital wage rates with wages in the economy as a whole by using the Employment Cost Index (ECI)[5] for the four Census Regions. (See Table 3 for the period 1977 through 1979.) In all regions except the Northeast, hospital wages rose faster than all private nonfarm wages. The relative rankings of percent increases by region for both hospital wages and the economy as a whole are similar for comparable periods. These variations in geographic rates of increase coincide with shifts in population and industry from the Northeast to the South and West (Data Resources, Inc., 1980).

In summary, some theoretical and statistical basis exists for concluding that there are Census Region variations in the rate of increase in hospital worker wages for some time periods. For the period 1977 through 1979, wages rose at rates significantly lower

[5] The Bureau of Labor Statistics' Employment Cost Index is a measure of average hourly earnings for the total private economy. The effects of overtime premiums and shifts in the skill mix have been controlled for in this index. The index was first available in the third quarter of 1975.

than the national average in the Northeast and significantly higher than the national average for the West, according to BLS data (Table 6). For the longer period 1973 through 1979, however, none of the four Census Regions differed significantly from the national average in the rate of increase (Table 6).

While much is known about hospital wage rate determination, significant gaps in our understanding remain. Monopoly power of hospital unions, monopsony power of hospital purchasers, the nursing shortage, medical licensure regulations, rate-setting regulations, skill mix shifts associated with new technology, external labor market conditions, and managerial slack are some of the major factors which must be considered when one tries to understand the hospital wage determination process at the local market or even at the individual hospital level.[6]

Due to organizational slack (Evans, 1970; Ginsburg, 1978; and Salkever, 1972) associated with nonprofit economic structure and cost-based reimbursement,

[6]For detailed analyses of the determinants of hospital wage rates and labor market dynamics, see Alexander (1974); Altman (1970); Edelson (1971); Ehrenberg (1974); Elliott, (1981); Fein and Bishop (1976); Feldman, Lee, and Hoffbeck (1980); Feldstein (1971); Feldstein (1979); Feldstein and Taylor (1977); Fottler (1977); Fuchs (1976); Hendricks (1977); Hixon, Rodgers, Reid, and Boehlert (1981); Hughes *et al* (1978); Link and Landon (1975); Metzger and Pointer (1972); Schramm (1977); Sloan and Steinwald (1980); Taylor (1977); Yett (1975); and Zubkoff (1978).

**TABLE 4**

**Hospital Employee Wage Levels by Census Region, Bureau of Labor Statistics and American Hospital Association Data Sources, 1972 and 1979**

| | Census Region | | | | |
|---|---|---|---|---|---|
| | U.S. Total | Northeast | North Central | South | West |
| Year | Average Hourly Earnings of Non-supervisory Workers in Private Hospitals, BLS[1] | | | | |
| 1972 | $3.22 | $3.49 | $3.08 | $2.72 | $3.67 |
| 1979 | 5.48 | 5.56 | 5.39 | 4.81 | 6.56 |
| Average Annual Rate of Increase 1972-1979 | 7.9% | 6.9% | 8.3% | 8.5% | 8.7% |
| | Payroll Expenses per Full-time Equivalent Hospital Worker, Nongovernment (Private) Community Hospitals, AHA[2] | | | | |
| 1972 | $7,086 | $7,831 | $6,960 | $6,098 | $7,443 |
| 1979 | 11,945 | 12,797 | 12,006 | 10,506 | 12,747 |
| Average Annual Rate of Increase 1972-1979 | 7.7% | 7.3% | 8.1% | 8.1% | 8.0% |
| | Payroll Expenses per Full-time Equivalent Hospital Worker, Total Community Hospitals, AHA[3] | | | | |
| 1972 | $7,051 | $8,003 | $6,934 | $6,007 | $7,577 |
| 1979 | 11,825 | 13,021 | 11,908 | 10,319 | 12,776 |
| Average Annual Rate of Increase 1972-1979 | 7.7% | 7.2% | 8.0% | 8.0% | 7.7% |

[1]Average hourly earnings data for the nation are published in monthly issues of Bureau of Labor Statistics, *Employment and Earnings*, Table C-2. Unpublished data for the four Census Regions were furnished through the courtesy of the Bureau of Labor Statistics for purposes of research. These unpublished data are not available prior to 1972 and do not meet Bureau of Labor Statistics publication standards for reliability.

[2]American Hospital Association, *Hospital Statistics*, 1972 and 1980 Editions. Payroll expense data are for "nongovernment not-for-profit community hospitals" and "investor-owned (for profit) community hospitals." The data are for hospital fiscal years.

[3]American Hospital Association, *Hospital Statistics*, 1972 and 1980 Editions. The data are for hospital fiscal years.

some hospitals may not be cost conscious buyers of labor.[7] Therefore, a wage rate variable in the input price index that is external to the hospital industry may be appropriate for some purposes, such as prospective rate setting. The choice for the variable should be consistent with efficient resource allocation within hospitals as well as between hospitals and the rest of the economy. The wage variable needs to be external to the hospital industry, yet reflect basic forces of supply and demand operating on workers of the skill mix levels hired by hospitals. Movements in the wage variable should be equitable relative to other workers in the economy with similar skill levels and work loads.[8] [9]

[7] On the issues of the degree of control hospitals have on wages for their employees and on the influence of organizational slack on wage determination, see Allison (1976); Edelson (1971); Feldstein (1971); M. Feldstein (1979); Feldstein and Taylor (1977); Hughes *et al.* (1978); Sloan and Steinwald (1980); Taylor (1977); and Zubkoff (1978).

[8] For contrasting views relating to the choice of external wage variables to include in an input price index, see Freeland, Anderson, and Schendler (1979); Gort *et al.* (1975); Harbridge House, Inc., (1978); Rossman *et al.* (1980); and Sloan and Steinwald (1980).

[9] It is important to note that an offset for productivity increases and an allowance for increases in intensity of services may be appropriate for prospective rate-setting (Altman and Eichenholz, 1974).

## Regional Variation in Rates of Increase for the Non-wage Component of the Input Price Index

Changes in the prices of non-wage inputs (excludes wages and salaries) showed little variation among the Census Divisions (Table 7)—much less variation than the price of labor. For the entire United States, the average annual rate of increase in the price of non-wage inputs for 1973 through 1979 was 9.7 percent (Table 7). The Mountain Census Division had the highest average rate of increase, 10.2 percent; the New England Census Division had the lowest, 9.4 percent, for this same period.

Table 8 documents the very close relationship of non-wage price increases for the nine Census Divisions and the nation. In none of the geographic areas are there *significant differences from the national index.* The simple correlation for annual percent changes between the Census Divisions and the nation vary from .99 in the North Central Region to .94 in the Mountain area for the period 1973 through 1979. The correlations are all significantly different from zero at the 0.01 level of significance for each Census Division.

**TABLE 5**
**Payroll Expenses per Full-time Equivalent Hospital Worker by Census Division, Total Community Hospitals and Nongovernment (Private) Community Hospitals, 1972 and 1979**

| | Total Community Hospitals, AHA[1] | | | Nongovernment (Private) Community Hospitals, AHA[2] | | |
|---|---|---|---|---|---|---|
| | Year | | Average Annual Rate of Increase | Year | | Average Annual Rate of Increase |
| Census Division | 1972 | 1979 | 1972-1979 | 1972 | 1979 | 1972-1979 |
| U.S. Total | $7,051 | $11,825 | 7.7% | $7,086 | $11,945 | 7.7% |
| Northeast Region | 8,003 | 13,021 | 7.2 | 7,831 | 12,797 | 7.3 |
| New England | 7,729 | 12,921 | 7.6 | 7,726 | 12,883 | 7.6 |
| Middle Atlantic | 8,095 | 13,055 | 7.1 | 7,870 | 12,765 | 7.2 |
| North Central Region | 6,934 | 11,908 | 8.0 | 6,960 | 12,006 | 8.1 |
| East North Central | 7,211 | 12,305 | 7.9 | 7,192 | 12,352 | 8.0 |
| West North Central | 6,279 | 10,953 | 8.3 | 6,359 | 11,072 | 8.2 |
| South Region | 6,007 | 10,319 | 8.0 | 6,098 | 10,506 | 8.1 |
| South Atlantic | 6,327 | 10,717 | 7.8 | 6,420 | 10,806 | 7.7 |
| East South Central | 5,733 | 10,091 | 8.4 | 5,847 | 9,967 | 7.9 |
| West South Central | 5,751 | 10,344 | 8.8 | 5,751 | 10,344 | 8.7 |
| West Region | 12,776 | 12,776 | 7.7 | 7,443 | 12,747 | 8.0 |
| Mountain | 11,317 | 11,317 | 8.6 | 6,420 | 11,215 | 8.3 |
| Pacific | 13,268 | 13,268 | 7.5 | 7,782 | 13,252 | 7.9 |

[1] American Hospital Association, *Hospital Statistics*, 1972 and 1980 Editions. The data are for hospital fiscal years.
[2] American Hospital Association, *Hospital Statistics*, 1972 and 1980 Editions. Payroll expense data are for "nongovernment not-for-profit community hospitals" and "investor-owned (for profit) community hospitals." The data are for hospital fiscal years.

**TABLE 6**

**Descriptive Statistics and Significance Tests for Annual Percent Changes in Average Hourly Earnings of Non-Supervisory Workers in Private Hospitals by Census Region, 1977-1979 and 1973-1979[1,2]**

| | Difference of Means for[3,4] Annual Percent Changes Between Census Regions and Nation (t-statistics are in parentheses) | | Simple Correlation Coefficient for Annual Percent Changes Between Census Regions and Nation (t-statistics are in parentheses) | |
|---|---|---|---|---|
| Census Region | 1977-1979 | 1973-1979 | 1977-1979 | 1973-1979 |
| Northeast | -2.3 | -1.0 | 0.92 | 0.70 |
| | (4.40)** | (0.97) | (2.38)* | (2.19)* |
| North Central | 0.7 | 0.4 | 0.97 | 0.81 |
| | (0.90) | (0.51) | (4.17)** | (3.06)** |
| South | 1.1 | 0.6 | 0.97 | 0.80 |
| | (1.27) | (0.70) | (3.84)** | (3.00)** |
| West | 1.4 | 0.8 | 0.18 | 0.77 |
| | (3.03)* | (1.0) | (0.18) | (2.72)** |

F-Statistic (3,8) for variance of mean across four regions for 1977-1979: 10.81**
F-Statistic (3,24) for variance of mean across four regions for 1973-1979: 1.36
*Significant at the .05 level.
**Significant at the .01 level.

[1]Average hourly earnings data for the nation are published in monthly issues of Bureau of Labor Statistics, *Employment and Earnings*, Table C-2. Unpublished data for the four Census Regions were furnished at the courtesy of the Bureau of Labor Statistics for purposes of research. These unpublished data are not available prior to 1972 and do not meet Bureau of Labor Statistics publication standards for reliability.

[2]There are three annual percent changes for 1977-1979 and seven annual percent changes for 1973-1979.

[3]The annual percent change for the national data is subtracted from the annual percent change for the Census Region.

[4]To avoid the assumption that the population variances are the same for the nation and Census Division, we have used the Cochran approximation to the Behrens-Fisher test statistic (see Snedecor and Cochran, 1967, p. 115). T-statistics are calculated in the usual manner, but are given (n-1) degrees of freedom rather than 2 (n-1) degrees of freedom.

**TABLE 7**

**Annual Percent Increases in Non-Wage Component[1] of Regional Hospital Input Price Indexes, 1973-1979**

| | Calendar Year | | | | | | | Period | |
|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1973-79 | 1977-79 |
| U.S. National | 7.6% | 13.1% | 11.4% | 8.2% | 8.0% | 8.2% | 11.2% | 9.7% | 9.1% |
| Northeast Region | | | | | | | | | |
| New England | 7.4 | 13.2 | 11.7 | 9.0 | 7.2 | 6.7 | 10.9 | 9.4 | 8.3 |
| Middle Atlantic | 8.2 | 13.5 | 11.1 | 8.2 | 8.0 | 7.7 | 10.8 | 9.6 | 8.8 |
| North Central Region | | | | | | | | | |
| East North Central | 7.6 | 13.0 | 11.4 | 8.3 | 8.3 | 8.6 | 11.7 | 9.8 | 9.5 |
| West North Central | 7.1 | 12.9 | 11.6 | 7.8 | 8.1 | 8.6 | 12.2 | 9.8 | 9.6 |
| South Region | | | | | | | | | |
| South Atlantic | 7.3 | 13.5 | 11.2 | 7.8 | 7.8 | 7.9 | 11.3 | 9.5 | 9.0 |
| East South Central | 6.9 | 13.2 | 11.6 | 7.9 | 7.9 | 8.3 | 11.9 | 9.7 | 9.4 |
| West South Central | 6.8 | 13.0 | 11.2 | 8.3 | 8.0 | 8.4 | 12.0 | 9.7 | 9.5 |
| West Region | | | | | | | | | |
| Mountain | 7.2 | 12.8 | 12.1 | 8.3 | 8.5 | 8.8 | 13.4 | 10.2 | 10.2 |
| Pacific | 7.3 | 12.7 | 12.0 | 8.7 | 8.5 | 8.4 | 10.4 | 9.7 | 9.1 |

[1]Excludes payroll expenses (wages and salaries).

**TABLE 8**

**Descriptive Statistics and Significance Tests for Annual Percent Changes in Non-Wage Component of Hospital Input Price Index by Census Division, 1977-1979 and 1973-1979[1,2]**

| Census Division | Difference of Means for[3,4] Annual Percent Changes Between Census Divisions and Nation (t-statistics are in parentheses) | | Simple Correlation Coefficient for Annual Percent Changes Between Census Divisions and Nation (t-statistics are in parentheses) | |
|---|---|---|---|---|
| | 1977-1979 | 1973-1979 | 1977-1979 | 1973-1979 |
| Northeast Region | | | | |
| New England | -0.9<br>(0.52) | -0.2<br>(0.18) | 0.99<br>(6.01)** | 0.96<br>(7.61)** |
| Middle Atlantic | -0.3<br>(0.21) | 0.0<br>(0.24) | 0.99<br>(6.91)** | 0.98<br>(11.76)** |
| North Central Region | | | | |
| East North Central | 0.4<br>(0.27) | 0.2<br>(0.14) | 1.00<br>(41.73)** | .99<br>(20.56)** |
| West North Central | 0.5<br>(0.30) | 0.1<br>(0.07) | 0.99<br>(17.78)** | .98<br>(10.59)** |
| South Region | | | | |
| South Atlantic | -0.1<br>(0.09) | -0.1<br>(0.10) | 1.00<br>(32.54)** | .99<br>(37.83)** |
| East South Central | 0.2<br>(0.14) | 0.0<br>(0.00) | 0.99<br>(28.48)** | .99<br>(16.49)** |
| West South Central | .03<br>(0.20) | 0.0<br>(0.00) | .99<br>(28.48)** | .98<br>(11.23)** |
| West Region | | | | |
| Mountain | 1.1<br>(0.58) | 0.5<br>(0.39) | 1.00<br>(852.75)** | 0.94<br>(6.24)** |
| Pacific | 0.0<br>(0.03) | 0.0<br>(0.04) | 0.99<br>(9.95)** | 0.97<br>(8.78)** |

F-Statistic (8,18) for variance of means across nine divisions for 1977-1979: 0.21.
F-Statistic (8,54) for variance of means across nine divisions for 1973-1979: 0.05.
**Significant at the .01 level.
[1]Payroll expenses (wages and salaries) are excluded from the index.
[2]There are three annual percent changes for 1977-1979 and seven annual percent changes for 1973-1979.
[3]The annual percent change for the national data is subtracted from the annual percent change for the Census Division.
[4]To avoid the assumption that the population variances are the same for the nation and Census Divisions, we have used the Cochran approximation to the Behrens-Fisher test statistic (see Snedecor and Cochran, 1967, p. 115). T-statistics are calculated in the usual manner, but are given (n-1) degrees of freedom rather than 2(n-1) degrees of freedom.

## Variation in Rates of Increase for Total Regional Input Price Indexes

The national version of the regional input price index (wage and non-wage components combined) increased at an average annual rate of 8.7 percent for the period 1973 through 1979 (Table 9). The Mountain Census Division had the highest average annual rate of increase for this period, 9.4 percent. The Middle Atlantic Census Division had the lowest average annual increase for this period, 8.0 percent. Table 9 documents that percent increases for the Census Divisions within a Census Region are markedly similar. This is primarily due to the use of the same wage variable for all Census Divisions within a Census Region. Since wages and salaries constitute approximately half of the cost shares, the price proxy associated with that expense category tends to dominate the value of entire indexes for Census Divisions within the Census Region.

Input prices rose 80 percent between 1972 and 1979 for the national version of the regional index (Figure 3). In the Northeast Region, input prices rose approximately 72 percent during this same period. In the North Central, South, and West Regions prices rose approximately 83 percent, 84 percent, and 86 percent, respectively.

For the period 1973 through 1979 no statistically significant differences occurred among regional average annual rates of change and the national rate of change (Table 10). The correlation for annual percent changes in the regional indexes and the national index ranged from a low of 0.87 in New England to a high of 0.95 in the East South Central and South Atlantic Census Divisions. All correlations were statistically significant at the 0.01 level of significance (Table 10).

**TABLE 9**
**Annual Percent Changes in Regional Hospital Input Price Indexes, 1973-1979**

| Census Division | Calendar Year | | | | | | | Period | |
|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1973-79 | 1977-79 |
| U.S. National | 6.5% | 10.2% | 10.6% | 8.2% | 7.6% | 8.3% | 9.8% | 8.7% | 8.6% |
| Northeast Region | | | | | | | | | |
| New England | 6.4 | 10.0 | 11.9 | 7.5 | 6.1 | 6.3 | 8.2 | 8.1 | 6.9 |
| Middle Atlantic | 6.6 | 10.0 | 11.6 | 7.1 | 6.4 | 6.8 | 8.1 | 8.0 | 7.1 |
| North Central Region | | | | | | | | | |
| East North Central | 6.2 | 10.4 | 9.9 | 9.1 | 7.8 | 9.1 | 10.4 | 8.9 | 9.1 |
| West North Central | 6.1 | 10.4 | 10.1 | 8.9 | 7.8 | 9.1 | 10.6 | 9.0 | 9.2 |
| South Region | | | | | | | | | |
| South Atlantic | 6.2 | 11.2 | 10.0 | 8.4 | 7.8 | 8.7 | 10.7 | 9.0 | 9.1 |
| East South Central | 6.0 | 11.2 | 10.2 | 8.5 | 7.8 | 8.8 | 11.1 | 9.1 | 9.2 |
| West South Central | 5.9 | 11.1 | 10.0 | 8.7 | 7.9 | 8.9 | 11.1 | 9.1 | 9.3 |
| West Region | | | | | | | | | |
| Mountain | 6.8 | 9.7 | 11.2 | 8.4 | 9.0 | 9.0 | 11.5 | 9.4 | 9.8 |
| Pacific | 6.9 | 9.7 | 11.2 | 8.7 | 8.9 | 8.8 | 10.0 | 9.2 | 9.2 |

**FIGURE 3**
**Regional Hospital Input Price Indexes, Comparison of Cumulative Growth, 1972-1979**

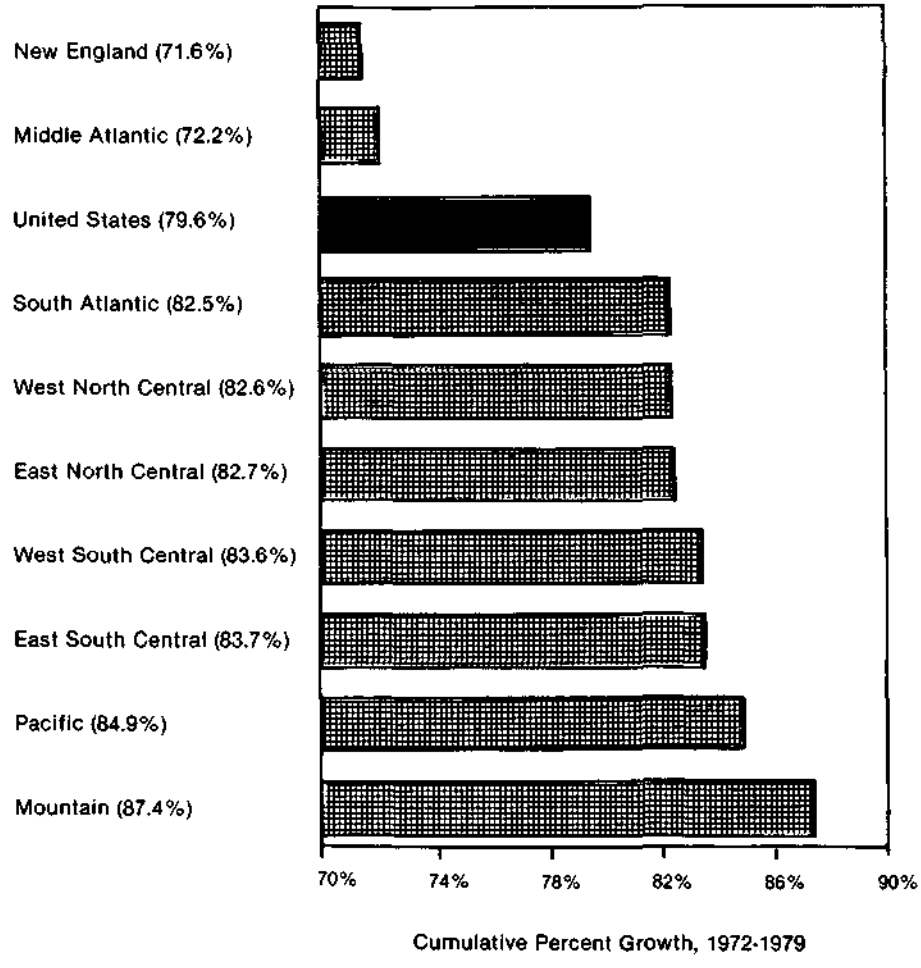


**TABLE 10**

**Descriptive Statistics and Significance Tests for Annual Percent Changes in Hospital Input Price Index by Census Division, 1977-1979 and 1973-1979[1]**

| Census Division | Difference of Means for[2,3] Annual Percent Changes Between Census Divisions and Nation (t-statistics are in parentheses) | | Simple Correlation Coefficient for Annual Percent Changes Between Census Divisions and Nation (t-statistics are in parentheses) | |
|---|---|---|---|---|
| | 1977-1979 | 1973-1979 | 1977-1979 | 1973-1979 |
| Northeast Region | | | | |
| New England | -1.7 | -0.7 | 0.97 | 0.87 |
| | (1.82)+ | (0.69) | (4.27)** | (4.01)** |
| Middle Atlantic | -1.5 | -0.7 | 0.99 | 0.88 |
| | (1.77)+ | (0.70) | (11.12)** | (4.08)** |
| North Central Region | | | | |
| East North Central | 0.5 | 0.2 | 0.98 | .93 |
| | (0.54) | (0.30) | (4.76)** | (5.46)** |
| West North Central | 0.6 | 0.3 | 0.99 | 0.94 |
| | (0.58) | (0.31) | (5.98)** | (6.20)** |
| South Region | | | | |
| South Atlantic | -0.5 | -0.3 | 1.00 | .95 |
| | (0.47) | (0.30) | (115.59)** | (6.64)** |
| East South Central | 0.7 | 0.3 | 1.00 | 0.95 |
| | (0.57) | (0.38) | (59.89)** | (6.67)** |
| West South Central | 0.07 | 0.3 | 1.00 | 0.93 |
| | (0.64) | (0.38) | (159.35)** | (5.66)** |
| West Region | | | | |
| Mountain | 1.3 | 0.6 | 0.95 | 0.89 |
| | (1.20) | (0.75) | (3.05)** | (4.36)** |
| Pacific | 0.7 | 0.4 | 0.92 | 0.94 |
| | (0.88) | (0.57) | (2.42)* | (5.93)** |

F-Statistic (8,18) for variance of means across nine divisions for 1977-1979: 1.81.
F-Statistic (8,54) for variance of means across nine divisions for 1973-1979: 0.49.
* Significant at the .05 level.
** Significant at the .01 level.
+ Significant at the .10 level.
[1]There are three annual percent changes for 1977-1979 and seven annual percent changes for 1973-1979.
[2]The annual percent change for the national data is subtracted from the annual percent change for the Census Division.
[3]To avoid the assumption that the population variances are the same for the nation and Census Division, we have used the Cochran approximation to the Behrens-Fisher test statistic (see Snedecor and Cochran, 1967, p. 115). T-statistics are calculated in the usual manner, but are given (n-1) degrees of freedom rather than 2(n-1) degrees of freedom.

For the three year period 1977 through 1979, the two Census Divisions in the Northeast Region (New England and Middle Atlantic) had average annual rates of increase that were less (at the 0.10 significance level) than the average annual rate of increase for the nation. Both of these Census Divisions had the same Census Region wage rate increase. (See Tables 1 and 3.) As mentioned previously, hospital rate setting by States in the Northeast Region may have contributed to the lower rates of increase.

## Relative Influence of Cost Shares and Price Changes on Regional Input Price Indexes

To determine the relative influence of price changes and weights on the Divisional indexes, we computed indexes for the following combinations of prices and weights:

Regional specific prices and regional specific cost shares referred to as *Regional Model*
Regional specific prices and national cost shares referred to as *Regional Price Model*
National prices and regional specific cost shares referred to as *Regional Weight Model*
National prices and national cost shares referred to as *National Model*

We found that variation in weights among the Census Divisions has no substantial effect on the values of the Census Division indexes and that geographic variation in the rate of price increases accounts for almost all the

variation in the indexes. (See Table 11 and Figures 4A to 4I.) The index which combines national weights and regional specific prices (Regional Price Model) captures most of the regional variation.

The national version of the regional index grew 79.6 percent between 1972 and 1979 (Table 11). When Census Division weights are combined with national rates of price increase for individual items, there are negligible differences in the cumulative growth of the indexes (Table 11).

Table 12 provides further evidence that differences in weights have a small effect on the rates of change of the input price indexes. Annual rates of input price changes for 1973 to 1979 for various hospital classifications (for example, teaching/nonteaching and number of beds categories) are nearly identical within the same Census Division.[10]

[10] This finding does not preclude differences in weights causing significant variation in composite input price increases when different levels of aggregation are used, such as individual hospital cost shares. If individual hospital weights are incorporated in an input price index used for reimbursement or rate setting, hospitals with an inefficient mix of inputs will not be penalized (P. Feldstein, 1979).

**TABLE 11**
**Four Model Analysis of Regional Input Price Index, Short-Term (1977-1979) and Long-Term (1972-1979) Cumulative Growth**

| | 1972-1979 | | 1977-1979 | |
|---|---|---|---|---|
| | Percent Growth | Percentage Point Difference From Baseline | Percent Growth | Percentage Point Difference From Baseline |
| U.S. Total (Baseline) | 79.6% | — | 18.9% | — |
| New England | | | | |
| Regional Weights | 79.9 | .3 | 18.9 | 0 |
| Regional Prices | 71.8 | -7.8 | 15.1 | -3.8 |
| Regional Model | 71.6 | -8.0 | 15.0 | -3.9 |
| Middle Atlantic | | | | |
| Regional Weights | 80.3 | .7 | 19.0 | .1 |
| Regional Prices | 72.1 | -7.5 | 15.5 | -3.4 |
| Regional Model | 72.2 | -7.4 | 15.4 | -3.5 |
| East North Central | | | | |
| Regional Weights | 79.6 | 0 | 18.9 | 0 |
| Regional Prices | 82.7 | 3.1 | 20.4 | 1.5 |
| Regional Model | 82.7 | 3.1 | 20.4 | 1.5 |
| West North Central | | | | |
| Regional Weights | 79.1 | -.5 | 18.9 | 0 |
| Regional Prices | 83.3 | 3.7 | 20.8 | 1.9 |
| Regional Model | 82.6 | 3.0 | 20.7 | 1.8 |
| South Atlantic | | | | |
| Regional Weights | 79.6 | 0 | 18.9 | 0 |
| Regional Prices | 83.0 | 2.9 | 20.4 | 1.5 |
| Regional Model | 82.5 | 3.4 | 20.3 | 1.4 |
| East South Central | | | | |
| Regional Weights | 79.3 | -.3 | 18.9 | 0 |
| Regional Prices | 84.2 | 4.6 | 21.0 | 2.1 |
| Regional Model | 83.7 | 4.1 | 20.9 | 2.0 |
| West South Central | | | | |
| Regional Weights | 78.6 | -1.0 | 18.9 | 0 |
| Regional Prices | 84.8 | 5.2 | 21.2 | 2.3 |
| Regional Model | 83.6 | 4.0 | 21.0 | 2.1 |
| Mountain | | | | |
| Regional Weights | 79.3 | -.3 | 18.9 | 0 |
| Regional Prices | 87.7 | 8.1 | 21.6 | 2.7 |
| Regional Model | 87.4 | 7.8 | 21.6 | 2.7 |
| Pacific | | | | |
| Regional Weights | 80.3 | .7 | 19.0 | .1 |
| Regional Prices | 84.6 | 5.0 | 19.8 | .9 |
| Regional Model | 84.9 | 5.3 | 19.8 | .9 |

**TABLE 12**

**Annual Rates of Change for Regional Input Price Indexes for Selected Hospital Classifications, 1973-1979**

| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|
| Total U.S. | 6.5% | 10.2% | 10.6% | 8.2% | 7.6% | 8.3% | 9.8% |
| New England | | | | | | | |
| All Hospitals | 6.4 | 10.0 | 11.9 | 7.5 | 6.1 | 6.3 | 8.2 |
| Teaching Hospitals | 6.4 | 10.0 | 11.9 | 7.5 | 6.1 | 6.4 | 8.1 |
| Nonteaching Hospitals | 6.3 | 10.0 | 11.8 | 7.5 | 6.1 | 6.3 | 8.2 |
| Hospitals Located in SMSA | 6.4 | 10.0 | 11.9 | 7.5 | 6.1 | 6.3 | 8.2 |
| Bedside Less than 100 | 6.2 | 10.0 | 11.6 | 7.5 | 6.1 | 6.4 | 8.3 |
| Bedsize Greater than 684 | 6.4 | 10.1 | 12.0 | 7.6 | 6.1 | 6.3 | 8.2 |
| Hospitals Located in non-SMSA | 6.2 | 10.0 | 11.8 | 7.5 | 6.1 | 6.3 | 8.2 |
| Bedsize Greater than 169 | 6.3 | 10.0 | 11.8 | 7.5 | 6.1 | 6.4 | 8.2 |
| West North Central | | | | | | | |
| All Hospitals | 6.1 | 10.4 | 10.1 | 8.9 | 7.8 | 9.1 | 10.6 |
| Teaching Hospitals | 6.1 | 10.5 | 10.0 | 8.9 | 7.7 | 9.1 | 10.7 |
| Nonteaching Hospitals | 6.0 | 10.5 | 10.1 | 9.0 | 7.7 | 9.1 | 10.6 |
| Hospitals Located in SMSA | 6.1 | 10.5 | 10.0 | 8.9 | 7.7 | 9.1 | 10.7 |
| Bedside Less than 100 | 6.0 | 10.5 | 10.1 | 9.0 | 7.7 | 9.1 | 10.6 |
| Bedsize Greater than 684 | 6.1 | 10.5 | 10.1 | 8.9 | 7.7 | 9.1 | 10.7 |
| Hospitals Located in non-SMSA | 6.0 | 10.4 | 10.1 | 9.0 | 7.7 | 9.1 | 10.6 |
| Bedsize Greater than 169 | 6.1 | 10.4 | 10.0 | 9.0 | 7.7 | 9.1 | 10.6 |
| South Atlantic | | | | | | | |
| All Hospitals | 6.2 | 11.2 | 10.0 | 8.4 | 7.8 | 8.7 | 10.7 |
| Teaching Hospitals | 6.2 | 11.2 | 10.0 | 8.5 | 7.8 | 8.7 | 10.8 |
| Nonteaching Hospitals | 6.1 | 11.3 | 10.0 | 8.3 | 7.7 | 8.6 | 10.7 |
| Hospitals Located in SMSA | 6.2 | 11.2 | 10.0 | 8.4 | 7.8 | 8.7 | 10.7 |
| Bedside Less than 100 | 6.1 | 11.3 | 10.1 | 8.4 | 7.8 | 8.6 | 10.7 |
| Bedsize Greater than 684 | 6.3 | 11.3 | 10.1 | 8.6 | 7.9 | 8.7 | 10.8 |
| Hospitals Located in non-SMSA | 6.1 | 11.3 | 10.1 | 8.4 | 7.8 | 8.6 | 10.7 |
| Bedsize Greater than 169 | 6.1 | 11.2 | 10.1 | 8.5 | 7.8 | 8.7 | 10.7 |
| Pacific | | | | | | | |
| All Hospitals | 6.9 | 9.7 | 11.2 | 8.7 | 8.9 | 8.8 | 10.0 |
| Teaching Hospitals | 7.0 | 9.6 | 11.3 | 8.8 | 9.1 | 8.9 | 10.1 |
| Nonteaching Hospitals | 6.8 | 9.8 | 11.1 | 8.6 | 8.9 | 8.8 | 10.0 |
| Hospitals Located in SMSA | 6.9 | 9.7 | 11.2 | 8.7 | 9.0 | 8.8 | 10.0 |
| Bedside Less than 100 | 6.6 | 10.0 | 11.1 | 8.5 | 8.7 | 8.7 | 10.0 |
| Bedsize Greater than 684 | 7.2 | 9.5 | 11.2 | 8.8 | 9.2 | 9.0 | 10.1 |
| Hospitals Located in non-SMSA | 6.8 | 9.8 | 11.1 | 8.6 | 8.9 | 8.8 | 10.0 |
| Bedsize Greater than 169 | 6.8 | 9.7 | 11.0 | 8.5 | 8.8 | 8.8 | 10.1 |

FIGURE 4A
Regional Hospital Input Price Index Percent Changes 1973-1979
New England Census Division

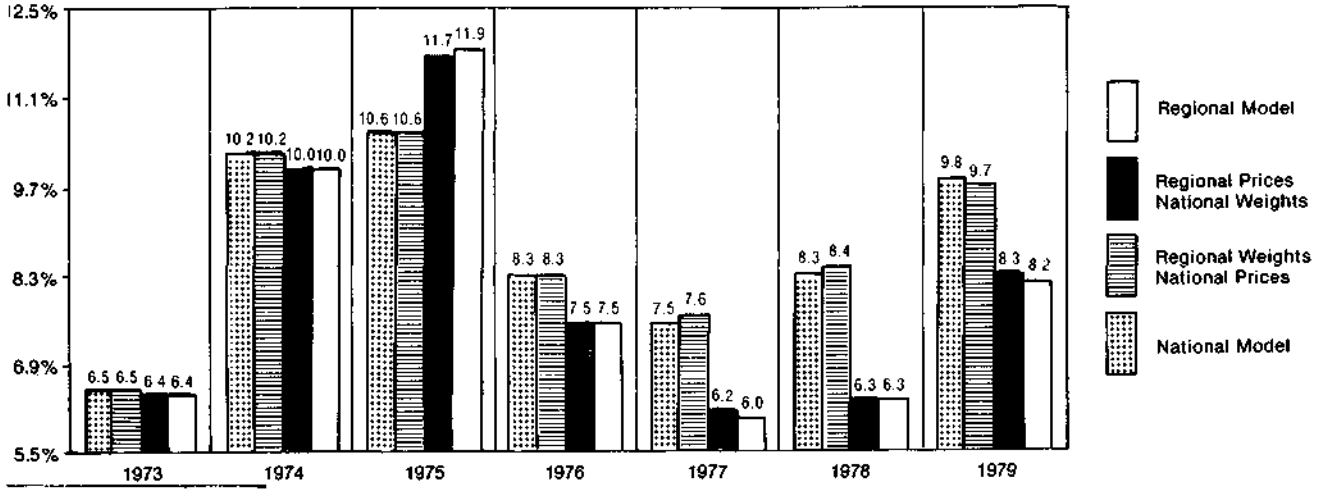



FIGURE 4B
Regional Hospital Input Price Index Percent Changes 1973-1979
Middle Atlantic Census Division

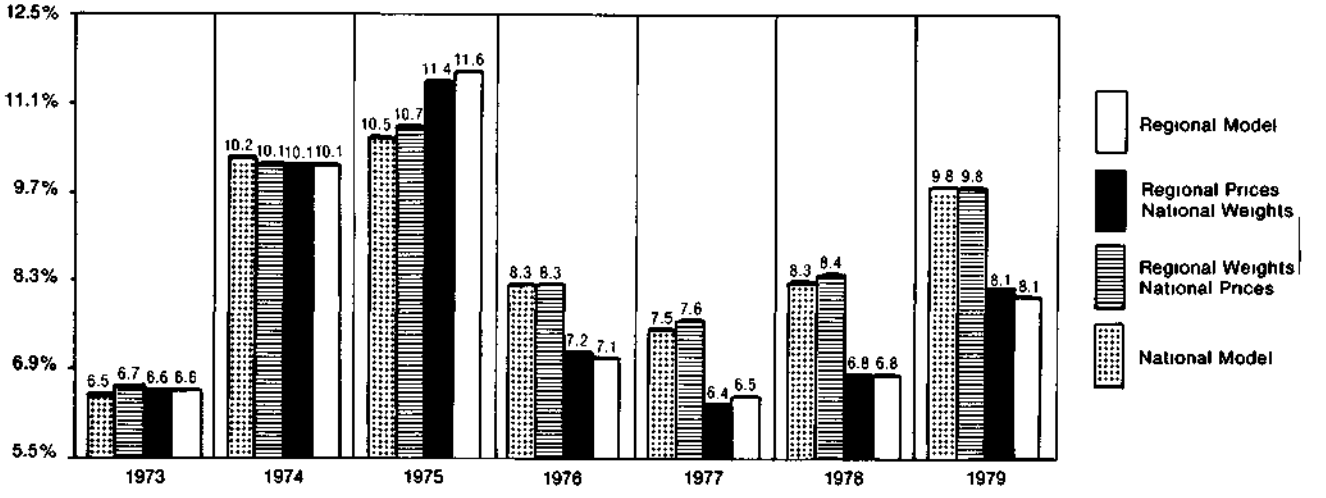


**FIGURE 4C**
**Regional Hospital Input Price Index Percent Changes 1973-1979**
**East North Central Census Division**

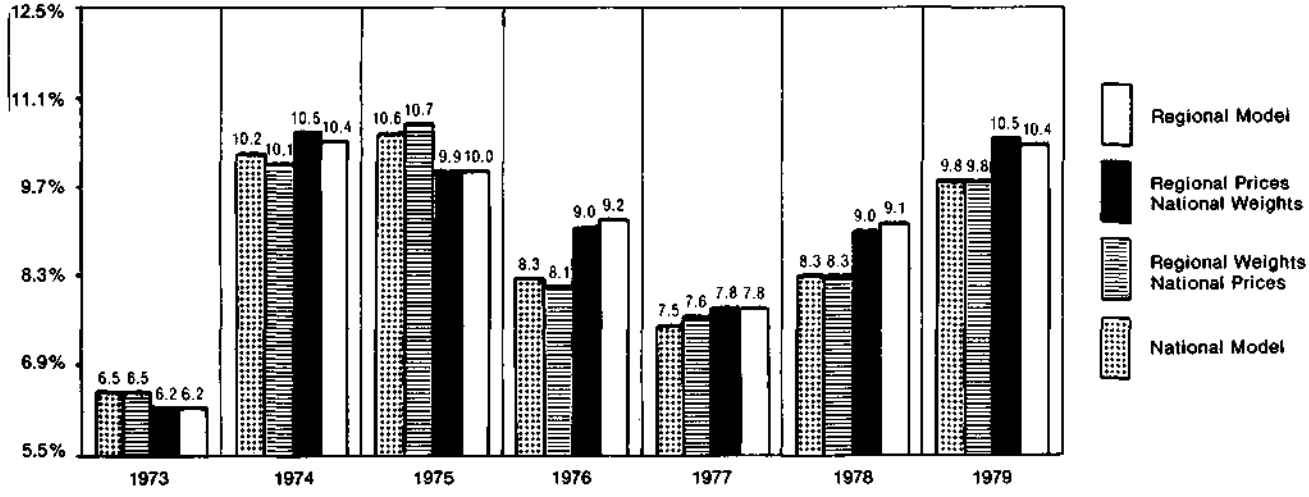



**FIGURE 4D**
**Regional Hospital Input Price Index Percent Changes 1973-1979**
**West North Central Census Division**

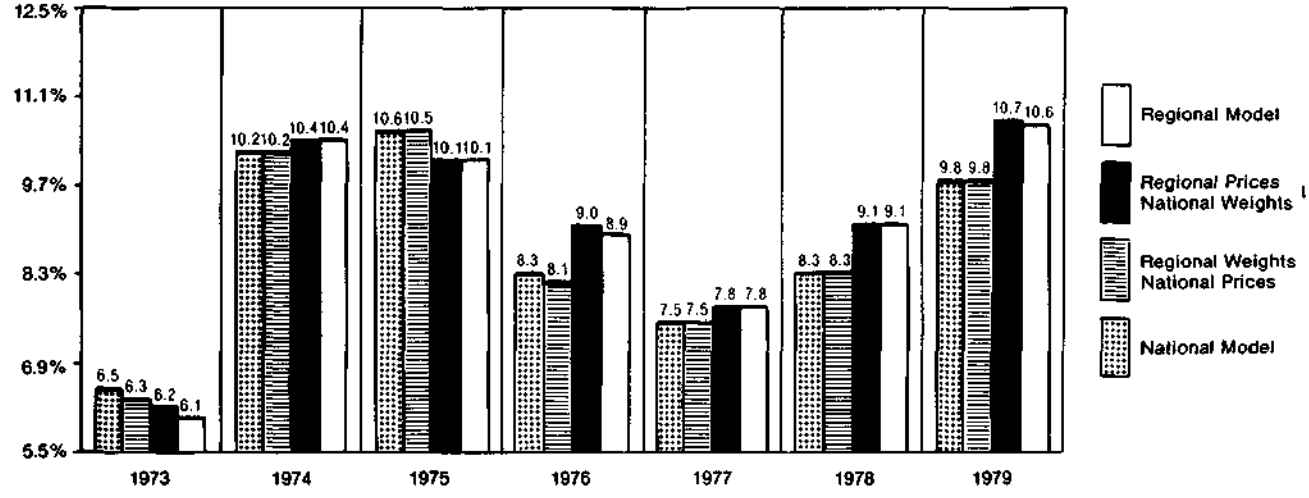


FIGURE 4E
Regional Hospital Input Price Index Percent Changes 1973-1979
Mountain Census Division

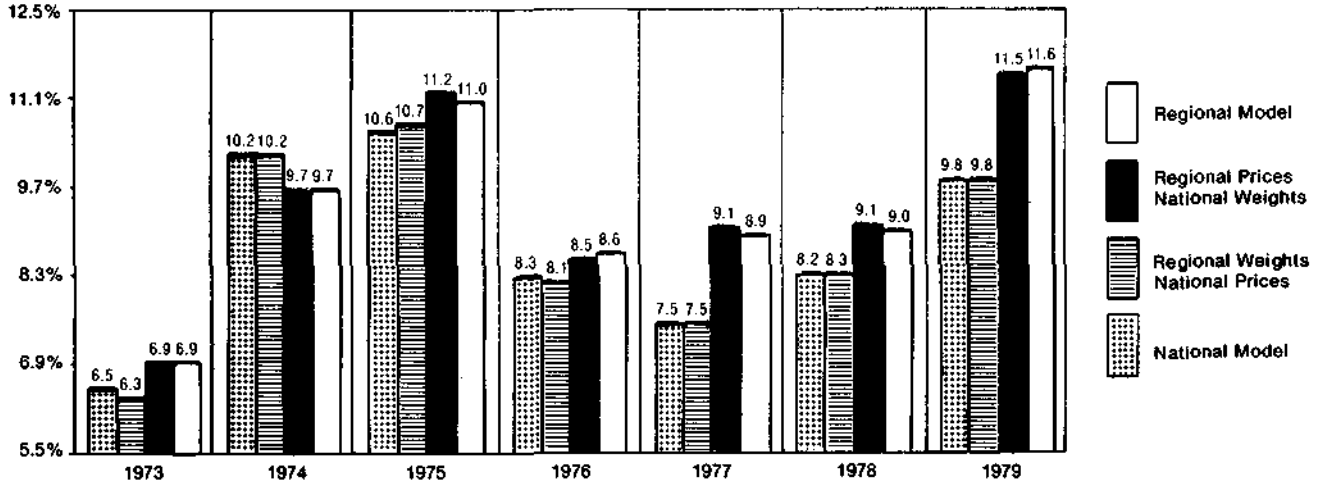



FIGURE 4F
Regional Hospital Input Price Index Percent Changes 1973-1979
Pacific Census Division

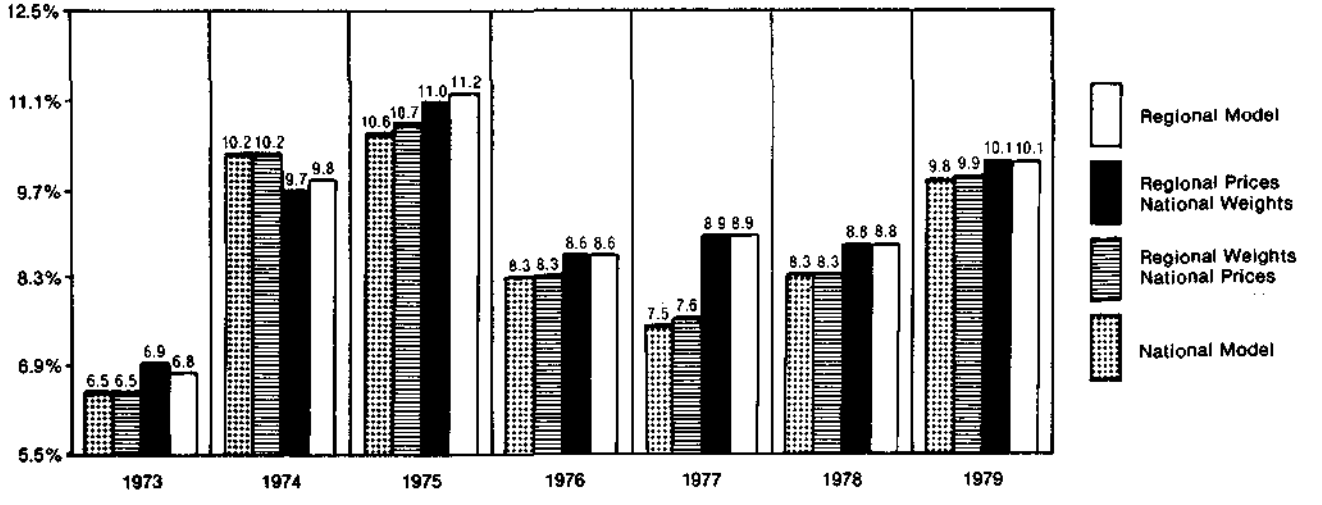


FIGURE 4G
Regional Hospital Input Price Index Percent Changes 1973-1979
South Atlantic Census Division

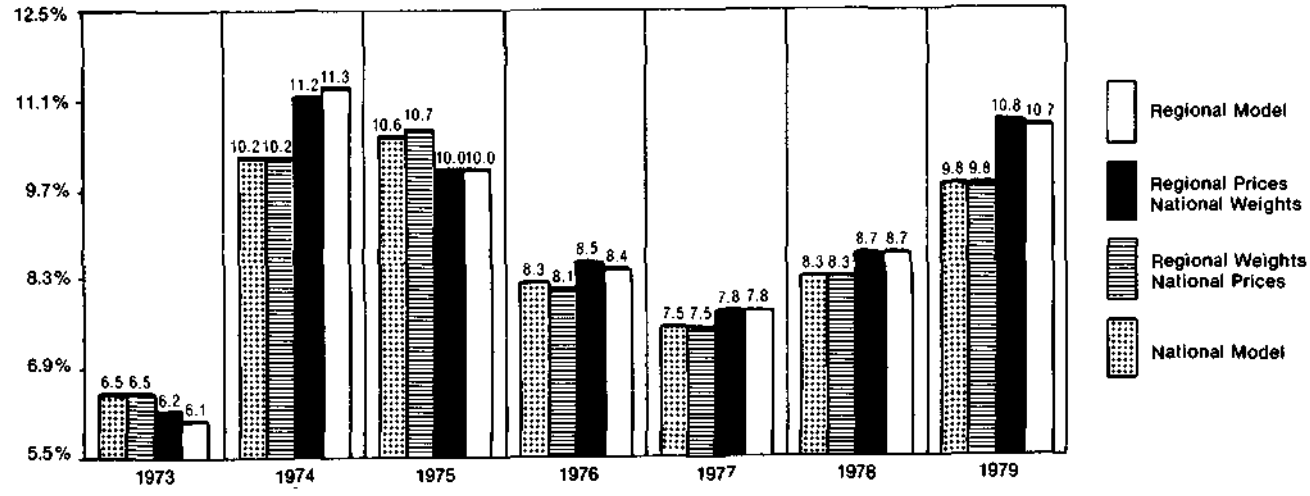



FIGURE 4H
Regional Hospital Input Price Index Percent Changes 1973-1979
East South Central Census Division

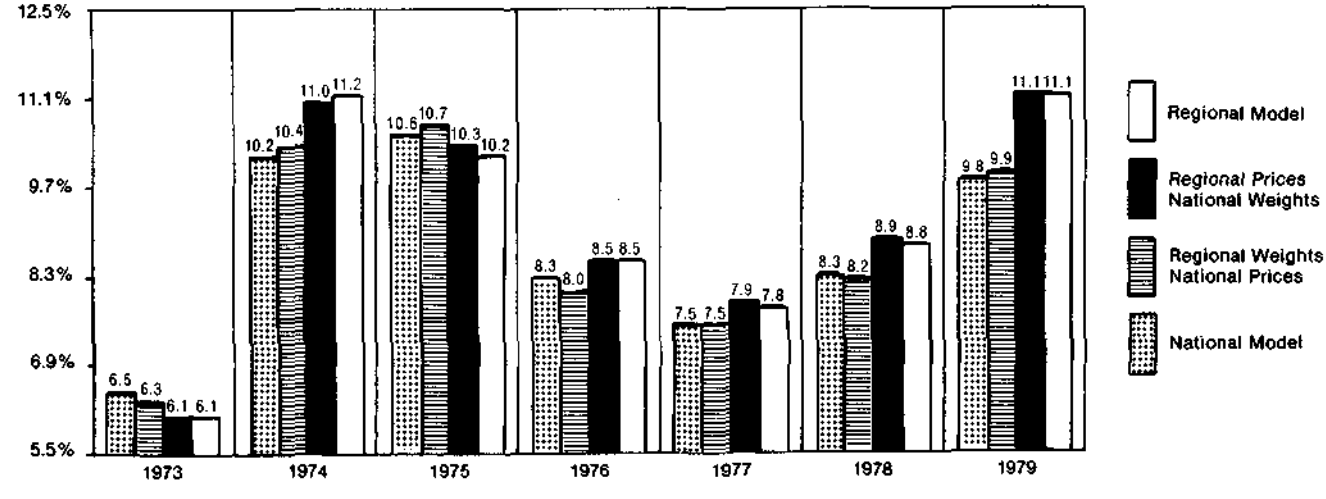
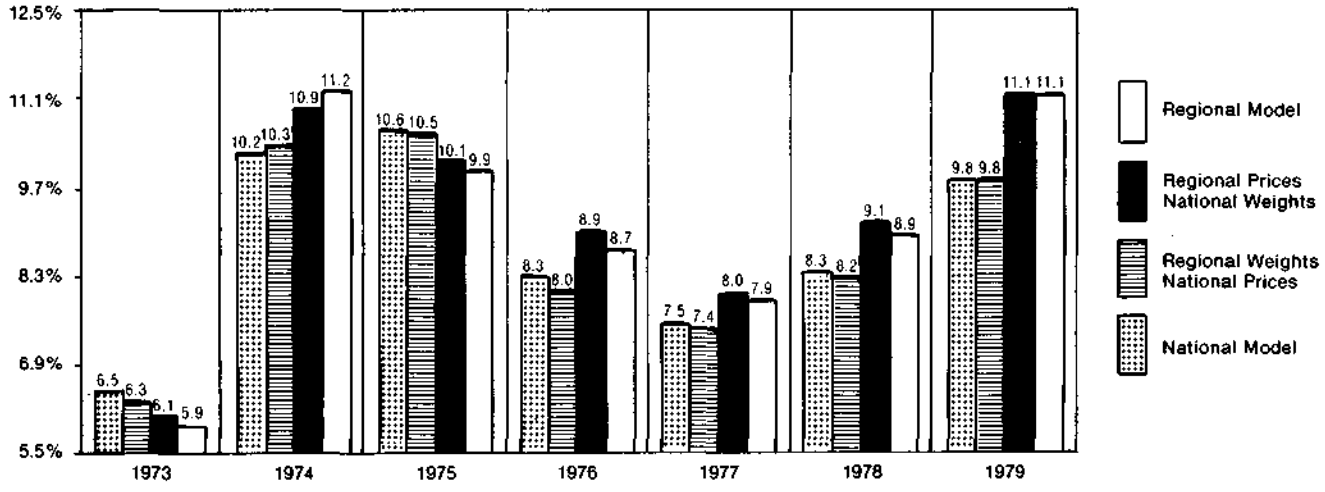


FIGURE 4I
Regional Hospital Input Price Index Percent Changes 1973-1979
West South Central Census Division




## Directions for Further Research

We regard the index described in this paper as a useful but preliminary attempt to capture geographic differences in rates of increase in hospital input prices. Additional work needs to be undertaken, especially relating to local area variation in hospital wage increases due to labor market conditions, regulations, union activity, skill mix shifts, and managerial slack. Other sources of information on geographic variation in fuel oil prices are being explored. Some national prices might also be replaced by regional prices. For example, price data related to construction costs are now being examined to determine if reliable and relevant area estimates can be made. As additional data become available, work will be needed to refine cost share weights for hospitals in the various classifications. Additional statistical tests could be applied to permit more effective identification of regional differences.

## Conclusion

In this paper we describe, from several perspectives, regional variation of hospital input price indexes relative to variation in the national hospital input price index.

We observed that Census Division and hospital classification differences in cost shares for various types of resource inputs do not substantially influence the regional indexes for price changes, but that geographic differences in price changes do influence these indexes. Different rates of wage rate increases accounted for most of the geographic variation, rather than different rates of increases for non-wage inputs. When the short-run and long-term regional average annual rates of growth in input prices were compared with the national rates of growth, generally, differences were not statistically significant.

## Appendix A

### The Census Region, Census Division, and State Breakdowns are:

**Northeast Region**

New England Division

- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

Middle Atlantic Division

- New Jersey
- New York
- Pennsylvania

**North Central Region**

East North Central Division

- Illinois
- Indiana
- Michigan
- Ohio
- Wisconsin

West North Central Division

- Iowa
- Kansas
- Minnesota
- Missouri
- Nebraska
- North Dakota
- South Dakota

**South Region**

South Atlantic Division

- Delaware
- District of Columbia
- Florida
- Georgia
- Maryland
- North Carolina
- South Carolina
- Virginia
- West Virginia

East South Central Division

- Alabama
- Kentucky
- Mississippi
- Tennessee

West South Central Division

- Arkansas
- Louisiana
- Oklahoma
- Texas

**West Region**

Pacific Division

- Alaska
- California
- Hawaii
- Oregon
- Washington

Mountain Division

- Arizona
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Utah
- Wyoming

## Appendix B

The hospital classifications are:

1. Teaching hospitals (have medical residents and interns)
2. Nonteaching hospitals (do not have medical residents and interns)
3. Hospitals in SMSA's (as defined by Bureau of the Census)
4. Hospitals in SMSA's with fewer than 100 beds
5. Hospitals in SMSA's with 100 to 404 beds
6. Hospitals in SMSA's with 405 to 684 beds
7. Hospitals in SMSA's with more than 684 beds
8. Hospitals not in SMSA's
9. Hospitals not in SMSA's with fewer than 100 beds
10. Hospitals not in SMSA's with 100 to 169 beds
11. Hospitals not in SMSA's with more than 169 beds
12. All hospitals

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