# Policy Implications for U.S. Agriculture of Changes in Demand for Food

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# Impact of the Food Service Industry on U.S. Agriculture

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## Background and Basic Concepts

Food service, which is defined as all food purchased and consumed away from home, is the most rapidly growing segment of the food industry.[1] It has grown to the point that about 45 percent of all food expenditures are for food-away-from-home.[2] Nevertheless, available U.S. per capita food consumption (food use) data and the food demand studies based upon these primary data implicitly assume that all food is sold through retail food stores to individual customers.[3]

For some purposes, such as identifying trends in overall food use, the lack of information regarding end users is of little consequence to food marketing. But, when it is desirable to explain trends using behavior models, this assumption is not defensible. Both food specifications and demand elasticities are known to differ substantially between food sold through retail food stores and that sold through food service channels. The markets are sharply segmented, in an economic sense.[4]

Both physically and in terms of added services, a pound of beef sold at wholesale to a grocery store for resale to the public is quite a different item than a pound of beef sold by a food service distributor to a restaurant, particularly in this day of portion-controlled, highly convenient, and closely specified foods. The market being served differs substantially in the amount and kind of service incorporated in the final product sold, and this difference is reflected in the product purchased in terms of grade and quality.

The differing specifications and amounts of services demanded are reflected in sharply differing price elasticities of demand in the markets for grocery-store food and restaurant food. These different elasticities occur both in final-product sales and procurement markets. The segmented demands and accompanying elasticities highlight the desirability of being able to distinguish the two products for purposes of analyzing

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[1]The usual definition includes as food-away-from-home some prepared or partially prepared meals that are carried home prior to consumption. These include: (1) carry-out meals prepared in restaurants and either carried home or delivered to homes for consumption, and (2) carry-out food prepared in "food stores" or convenience stores that also may be carried home prior to consumption.

[2]This total includes government and industry spending as well as consumer expenditures and the value of food consumed on farms.

[3]This statement, of course, does not apply to data from household food consumption surveys. However, those data usually are not compatible with production and per capita food use data.

[4]Market segmentation is a well-known marketing principle that is firmly rooted in the economics of first-degree price discrimination. Profitable market segmentation requires that the price elasticities differ among the segments, as when selling airline tickets to people traveling on business as opposed to tourists.

Further conditions require that the markets be separable to prevent arbitrage, which the airlines accomplish by requiring advance purchase of tickets and stays extended over weekends, and that marginal revenues exceed marginal costs during at least a portion of projected outputs.

the efficiency of marketing and for understanding the factors affecting product demands.

Decisions made by the food service industry are known to have dramatic impacts upon food processors, food manufacturers, and agricultural producers. However, the magnitude of these decisions and the impact on many individual products are not known with precision because data are not available to allow such analysis. For this reason, it is necessary first to develop the appropriate primary data and then conduct the appropriate impact analysis.

Because of the lack of demand information, production decisions often ignore important product specifications desired by the food service industry; farmers and food processors do not recognize the make up of their customers and the nature of their needs. The two ends of the marketing channel often fail to communicate and may work at cross purposes.

## Statement of the Problem

There are no current, comprehensive published data giving food quantities, prices, or expenditures for individual foods used in the U.S. food service industry that could be used for the purpose of analyzing demand for food service. USDA has published only aggregate dollars of food service expenditures annually for the past two decades, with no food product details available (Putnam 1989). However, surveys of food service establishments were conducted in 1969 and 1979, and each survey obtained detailed product and type of food service industry data for a single year (Van Dress 1971, 1972, 1982).

The purposes of this paper are to (1) present some alternative ways that the needed food service information could be obtained, other than replicating the two earlier efforts (which is not considered feasible or cost-effective), and (2) provide the results of some recent attempts at developing related data.

The primary U.S. food consumption data—other than those obtained through periodic household food consumption surveys—are derived on the basis of "disappearance" through food marketing channels.

Total available supply is defined as U.S. production plus imports and less exports. Livestock feed and nonfood uses of food products are subtracted to derive total food supplies. Farm-level supply, by product or commodity group, is adjusted to retail-equivalent weights using standard conversion factors which account for waste and loss through production and marketing channels. After adjusting for available end-of-year stocks, the result is divided by population to put total food use or consumption into per capita terms (Hiemstra 1965).

Food consumption data based on the disappearance method do not distinguish separate consumption by type of end user. As noted earlier, the implied assumption is that all food is marketed through retail food stores.

Other serious data limitations exist for disappearance data since only aggregate price data for food service are published by the Bureau of Labor Statistics. No commodity or type of establishment price data are available for food-away-from-home uses. Subcomponent price series are published for breakfast, dinner, and snacks, but the trends are strikingly similar.

## Importance of the Problem
### Product Impact

The food service industry has grown so large and important that strategic decisions made by individual companies in food service have a dramatic impact on agricultural producers. For example, the decision by McDonald's Corporation to roll out an experimental pork product called McRib had a noticeable and measurable impact on the market for hogs in this country. McDonald's estimated sales from this product alone to be in the range of $140 million in a single month (Chaudhry 1989). One estimate, attributed to Glenn Grimes, University of Missouri, indicated that this single food service decision increased the demand for pork by 1.5 to 2.3 percent and raised hog prices to farmers by 3 to 4 percent (*Journal & Courier* 1989). The negative cross-product effects on sale of hamburgers (beef) and chicken of this test, however, were not estimated.

Similarly, the introduction of Chicken McNuggets by McDonald's and other copycat products a few years ago irreversibly affected the price relationship between white and dark poultry meat. More recently, the introduction of buffalo wings being merchandised by Kentucky Fried Chicken and others has expanded demand for chicken wings to the point where the industry currently is wishing each chicken had three wings.

More recently, the new low-fat hamburger launched by McDonald's, and currently being copied by its competitors, may dramatically affect the market for hamburger. The product appears to be here to stay.

### Demand Relationships

Another way of assessing, in aggregate terms, the importance of separating demand for food-at-home from demand for food-away-from-home is to consider the differences in their income or expenditure elasticities of demand. For food-at-home, these elasticities usually are found to be in the range of 0.1 to 0.2, whereas for food-away-from-home, elasticities based on household data have been found to be in the range of 0.6 to 1.0 (Smallwood 1981; Gieseman and Moulton 1986).

Expenditure elasticities based on cross-sectional data from individual expenditure or food intake surveys show demand for food-away-from-home as low as 0.3 to 0.5 (McCracken and Brandt 1987, Yang and Basiotis 1988). The McCracken and Brandt study measured demand for food-at-home at 0.17. It is clear—based on the estimates available—that demand responses are dramatically different for the food-at-home and food-away-from-home sectors of the food industry.

### Trade Practices

A further indication of the importance of distinguishing between food products destined for food service as opposed to retail food stores is to note wholesale industry practices themselves. Operations of food service distributors normally are separate and quite distinct from wholesale sales to the grocery food trade. This fact should facilitate data collection. Also, most

large retail food chains have integrated backward to absorb their food wholesaling functions; this has happened to only a limited extent in the food service industry. Most food service operations rely on traditional wholesalers for their supplies in part, because the types of products, as well as their specifications, purchased by food service operations differ substantially from food sold through retail food stores. Another reason relates to types and sizes of specialized food service clients and their demand for additional wholesaling services beyond those required by retail food stores.

### Professional Recommendations

A special committee of the American Agricultural Economics Association was convened in August 1989 to identify the major data problems related to food demand.[5] This committee identified improved data related to food-away-from-home consumption as being its first priority. Similarly, USDA's Regional Project S-216 (which is hosting this Symposium) assigned high priority to analyzing factors associated with demand for food at its last annual meeting in San Antonio, Texas. The lack of data on both price and quantity severely hampers demand analysis for both food-at-home and food-away-from-home.

### Alternative Sources of Data
#### Disappearance Data

An attempt to parallel for food-away-from-home the same type of disappearance method used for food-at-home has not been successful.[6] The necessary data simply are not currently available from the U.S. Bureau of Census's *Commodity Line Sales* (1982a). Wholesale sales to all types of outlets are classified in considerable commodity detail under "Groceries, general line", but there is no separation between sales of food service wholesalers and other general line wholesalers.

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[5]This committee met in Baton Rouge, Louisiana, as a pre-conference session of the annual meetings of the Association.
[6]Primary procedures and historical data can be obtained from *U.S. Food Consumption, Sources of Data and Trends 1909-63* (Hiemstra 1965).

Wholesale data in the future could, and should, be classified separately between food service distributors and other general line sales, because establishments in the industry are customarily stratified on this basis. However, changes in Bureau of the Census's definitions would first need to be made, and such changes are not expected anytime soon.

### CREST Data
Panel survey data related to purchases on a quarterly basis from the food service industry are presently available on a proprietary basis from CREST (Chain Restaurant Eating-Out Share Trends, or more recently, Consumer Reports on Eating Share Trends) (NRA 1991). CREST is a national survey of 10,000 demographically representative households covering spending patterns for about 30,000 individuals, conducted by National Purchase Diary Research, Chicago. The survey is focused exclusively on spending in restaurants. These data have been collected quarterly since 1975 but few demand analyses have been published using these data.[7]

One exception is the very useful demand analysis based on one year's data from CREST which was presented by Smallwood (1981) to the Annual Meetings of the Society for the Advancement of Food Service Industry Research. The focus of that study was on differences in demand elasticities by type of food service establishment rather than differences by commodity group.[8]

Considerable commodity detail is available for analysis in the CREST data. At this time, USDA plans to purchase access to historical data from CREST. This is a rich data set that can address many of the analytical problems indicated earlier.

### Survey Data
In spring 1990, researchers at Purdue University attempted to conduct a survey to ascertain sales of food service products directly from wholesale food service distributors. Since food service wholesaling operations are quite separate and distinct from sales to food stores, even within the same company, it appeared feasible to survey the distributors directly to obtain the necessary information.

Questionnaires were developed and sent to the 100 largest food service wholesaling operations in the United States. However, fewer than 10 respondents provided the requested information, and all of the respondents were specialized operations. None of the full service operations cooperated by providing data, citing confidentiality of such information.

An alternative approach would be to survey restaurant and other food service establishments as was done to collect data in 1969 and 1979. But, such a survey likely would be even more fragmented than earlier, due to the nature of the industry, and the usefulness of the data would be questionable. Also, such survey would come at a high cost. In contrast, wholesale food service distributors tend to be much more specialized operations for at least the major segments of food wholesaling, and therefore would appear to be more amenable to obtaining good survey results, if industry cooperation could be obtained.

### Input-Output Data
The Department of Commerce has released computer tables containing input-output data for a total of 537 industries for both 1977 and 1982. Among these industries are eating and drinking places, hotels, hospitals, nursing homes, and schools. Also included are 45 categories of food and kindred products. Since intermediate product sales data are provided for each of these industries to all others in the matrix of the use table, information is available for a large segment of the food industry decomposed into a significant number of food service industries.

There are some significant problems in the use of these data, however, not the least of which is that the data are quite old. The quality of the data is still being analyzed. For example, the available Bureau of Labor Statistics (BLS) price data from the Producer Price Index (PPI) are not entirely consistent with the input-output data, particularly for 1977. This inconsistency causes a problem for computing constant dollar expenditures for individual industries, and in using the data for demand analysis.

Another problem is that some of the cells in the basic tables may have been estimated by the Commerce Department rather than based on actual reported census information, particularly for some of the detailed industry groups of particular interest to this study. Also, the Commerce Department reallocated sales from a number of industries where they are of relatively minor importance into their primary categories. While some such changes are likely beneficial to this study, in concept, some of these reallocations are only vaguely understood at this time; the reallocations therefore make comparisons difficult with other known data, such as with prices published by BLS in the PPI.

For example, restaurant and bar sales of hotels and motels, bowling alleys, private clubs, gambling casinos, and museums have been reallocated to eating and drinking places. Similarly, meal and beverage receipts for several retail establishments such as drug stores and department stores have been redefined into eating and drinking places. Also, boarding house receipts of private (but not public) elementary and secondary schools and dining hall receipts of private institutions of higher education have been moved to eating and drinking places. Sales of school lunches served in public schools, food sales by public institutions of higher education, and food and beverage sales of military associated organizations like post exchanges, however, were put with government sales.

In similar manner, where wholesalers process one product into another, the activity has been redefined as manufacturing, and manufacturers' resales without processing have been reclassified as wholesale trade. This process is helpful in reducing the volume of intermediate sales categorized as wholesaling, for purposes of tracking primary food products, but the problem of consistency with other data is increased.

In spite of these problems, input-output data are available for analysis on a constant-dollar basis and provide information on many different primary categories of processed food products used in several different categories of food-away-from-home. The primary data are comprehensive and internally consistent for 1977 and 1982.

### Analysis of Input-Output Data
### Data Analysis
Purdue University has obtained the primary data for this analysis from input-output tables for 1977 available on computer tape from the U.S. Department of Commerce. Similar data for 524 industry groups were obtained for 1982 and 1985 from IMPLAN, an analytical group at the University of Minnesota that had developed detailed coefficients for 1982 and 1985.[9] After adjusting the IMPLAN data for consistency with commerce data for the industries concerned, the Purdue study developed an input-output "use" table for 56 selected industries for 1982 and 1985.

The selected industries included three categories of primary agricultural and other basic food commodities (livestock, crops, and seafood/forestry); 45 categories of food and kindred products; five industry categories of food-away-from-home (eating and drinking places, hotels, health related, education related, and social services); retail trade (other than food-away-from-home); wholesale trade; and the "rest of the world" (which includes mining, general manufacturing, finance, government, and other miscellaneous industries). The initial matrix was developed using the IMPLAN model.[10] The detailed procedures appear in Appendix I.

[7]Aggregate data from this source are published quarterly by the National Restaurant Association in *Restaurants USA* (1991). In addition, many other special studies based on these data are routinely published by NRA.

[8]For example, the study showed that the income elasticity of demand for fast food establishments was about 0.24 using an ordinary least-squares model. For "atmosphere" establishments, the elasticity was measured at 1.09.

[9]IMPLAN (Impact Analysis for Planning) is concerned primarily with analysis of recreation, tourism, and forestry industries for which detailed geographic analysis is of primary importance.

[10]IMPLAN has developed a user-friendly model which allows easy manipulation of the necessary matrices in isolating the coefficient by county and for selected subsets of industries.

Coefficients for the 56 industries of interest for 1977, 1982, and 1985 were projected forward to 1990 after interpolating for the missing years. The projection employed a two-step approach (SAS Proc Forecast). The first step was a linear regression model applied to the nine years of data for each cell of the matrix. Residuals from the first step were used in an autoregressive model employing a three-year lag. The coefficients were converted back to an input-output use table made up of intermediate sales data with 1977 and 1990 data converted to 1982 dollars. To the extent possible, PPI prices for matching industries or industry groups were used for purposes of deflation.

These data allowed calculation of percentages of total industry usage by the five food-away-from-home industries from the outputs of the 45 food and kindred product industries. That is, these are calculations across rows from the input-output use table, and reflect demands facing the food industries. Similarly, percentage calculations by column were made that show the relative importance of each of the 45 food and kindred product industries in producing a unit of intermediate output for each of the five categories of food-away-from-home. These percentages represent the supply side of the market for food service industries. See Appendix 1 for more procedural details.

## Results of the Analysis

The input-output data for 1977 show that 38.1 percent of the total intermediate output of food and kindred product industries went into food-away-from-home industries (Figure 1 and Table 1). This figure increased to 41.3 percent for 1990, based on the projections. These data are measured in terms of constant-dollar expenditures at producer (food processor and food manufacturer) prices. Such intermediate output does not include the input of the capital and labor necessary to process and move the products to consumers.[11] It is interesting to note that

[11]Data will soon be available to bridge this gap between intermediate output and personal consumption expenditures for the various food processing industries. See the next section of this report, "Share of Personal Consumption Expenditures," which gives such data for major industry groups in terms of changes between 1972 and 1982.

this projected figure of 41.3 percent in terms of intermediate output for 1990 is close to the 45 percent share of total personal consumption expenditures going for food-away-from-home, measured in consumer dollars.

Of the 38.1 percent of intermediate outputs for all food-away-from-home industries in 1977, 35.0 percent was from eating and drinking places (as defined by the Department of Commerce) and the remaining three percentage points were from the remaining four categories of food-away-from-home discussed above. In 1990, the eating and drinking places percentage increased to 37.3 percent of the 41.3 percent total for food-away-from-home.[12]

For the individual food groups, total food-away-from-home industries accounted for 48.7 percent of the intermediate output of meat packing plants and 63.6 percent of output from the sausage and prepared meat product industry in 1990 (Figure 2 and Table 1). These percentage figures are increases from the 1977 levels. It is interesting to note that these changes for food-away-from-home occurred at the same time as a 16.4 percent increase in total real intermediate output by meat packing plants over the 13-year period (Table 2). Total intermediate output of prepared meat products declined, however, by 39.1 percent. The two intermediate industries in total experienced an increase in output of 7.2 percent in real terms.

The total value of intermediate output of poultry processing taken by eating and drinking places climbed sharply during the period of study (up 170 percent, Table 2). However, there was a decline in the share of intermediate usage of poultry dressing plant products taken by food-away-from-home industries during 1977 through 1990.

This decreasing importance of food-away-from-home for intermediate poultry products is difficult to understand, based on what is known about the

[12]The relative importance of the four other categories is artificially low due to the reallocation of sales from these industries by the Commerce Department, as noted earlier.
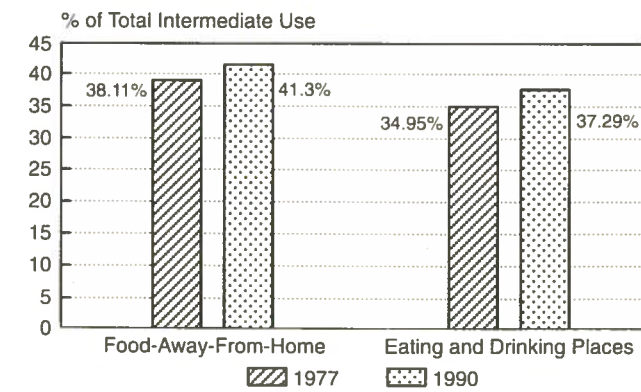
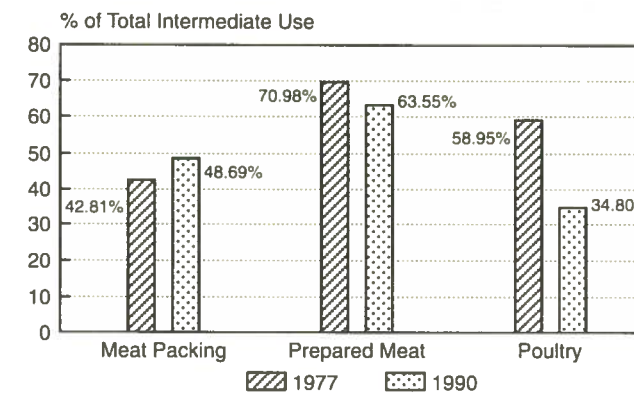Figure 1. Food and kindred products used by FAFH, 1977 and 1990



Figure 2. Meat and poultry products used by FAFH, 1977 and 1990

adoption of chicken sandwiches and various chicken nugget products in fast food operations during the 1980s. However, perhaps the focus on new products has masked the declining consumption of traditional deep-fried chicken products, which are known to have fallen out of favor. In other words, the data suggest that there may have been more of a substitution of new poultry products for old, rather than a sizable new market developed, within the fast food industry. Also, these data for poultry relate only to intermediate products rather than final products. It is well known that further processing of poultry prod-

ucts gained importance in recent years, which is measured as inputs of labor and capital rather than primary products.

Some of the other industries that showed food-away-from-home using more than one-half of food processing or manufacturing intermediate outputs in 1990 included the following:

- Ice cream and frozen desserts
- Canned specialty products
- Canned fruits and vegetables
- Fresh or frozen packaged fish
- Frozen fruits, juices, and vegetables
- Frozen specialties
- Bread, cake and related products
- Cookies and crackers
- Malt liquors
- Distilled liquors
- Bottled and canned soft drinks

Most of these products are known to be used heavily as intermediate products in food-away-from-home industries. However, in looking at the data, some of the levels of output seem high. One needs to be reminded that these data are preliminary and subject to change when final 1982 data are analyzed and projected to 1990.

The data for 1977 are firm and not subject to revision. They also show the strong importance of food-away-from-home in using intermediate food industry output. Products like prepared meats, poultry, butter, ice cream, both fresh and canned seafoods, pickles and salad dressings, frozen fruits and vegetables, bread and other bakery products, alcoholic beverages, soft drinks, and coffee apparently have long been dominated by food-away-from-home demands for food industry intermediate output.

Looking at the data by column, that is, at the input or supply side of the food-away-from-home industry, one needs to focus on eating and drinking places rather than total food-away-from-home to avoid the effect of inputs of nonfood supplies into hotels, hospitals, schools, and social services. These data

**Table 1. U.S. intermediate commodities used by the food-away-from-home industry, 1977 and 1990 (millions of 1982 dollars)**

| Commodities[c] | Eating and Drinking Places | | | | Total Food-Away-From-Home | | | | Total Intermediate Use | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1977 | % of[a] 77 TIU | 1990 | % of 90 TIU | 1977 | % of 77 TIU | 1990 | % of 90 TIU | 1977 | 1990 |
| Livestock & livestock products | 605.9 | 0.94 | 288.8 | 0.46 | 724.6 | 1.12 | 352.6 | 0.56 | 64643.5 | 62660.1 |
| Other agriculture products | 944.2 | 1.81 | 1023.7 | 2.20 | 1094.3 | 2.10 | 1252.6 | 2.69 | 52222.6 | 46542.3 |
| Forestry & fishery products & services | 1011.7 | 5.14 | 985.1 | 4.05 | 1190.6 | 6.04 | 1410.3 | 5.79 | 19700.8 | 24350.0 |
| Meat packing plants | 6368.4 | 38.93 | 8228.0 | 43.22 | 7002.9 | 42.81 | 9271.0 | 48.69 | 16360.1 | 19039.3 |
| Sausages & other prepared meat products | 2074.4 | 64.32 | 1122.0 | 57.11 | 2289.2 | 70.98 | 1248.4 | 63.55 | 3225.2 | 1964.5 |
| Poultry dressing plants | 883.4 | 51.78 | 1379.7 | 29.94 | 1005.8 | 58.95 | 1603.7 | 34.80 | 1706.2 | 4608.7 |
| Poultry & egg processing | 127.7 | 27.39 | 105.2 | 20.48 | 136.5 | 29.28 | 115.3 | 22.44 | 466.3 | 513.7 |
| Creamery butter | 487.3 | 55.98 | 276.8 | 28.58 | 532.8 | 61.22 | 304.8 | 31.47 | 870.4 | 968.6 |
| Cheese, natural and processed | 816.3 | 30.03 | 1545.4 | 24.50 | 857.1 | 31.53 | 1679.9 | 26.63 | 2718.0 | 6308.7 |
| Condensed and evaporated milk | 389.7 | 19.35 | 744.7 | 24.68 | 409.6 | 20.34 | 867.8 | 28.76 | 2013.6 | 3017.4 |
| Ice cream and frozen desserts | 946.2 | 90.87 | 671.1 | 75.97 | 1013.9 | 97.38 | 740.2 | 83.79 | 1041.2 | 883.4 |
| Fluid milk | 1190.6 | 23.14 | 1803.2 | 31.21 | 1620.7 | 31.50 | 2264.4 | 39.19 | 5144.4 | 5777.5 |
| Canned and cured sea foods | 311.0 | 81.01 | 23.1 | 24.06 | 362.6 | 94.44 | 29.4 | 30.59 | 383.9 | 95.9 |
| Canned specialties | 123.5 | 75.17 | 373.7 | 55.46 | 160.7 | 97.80 | 498.0 | 73.90 | 164.3 | 673.9 |
| Canned fruits and vegetables | 1042.1 | 58.27 | 1123.4 | 50.17 | 1279.9 | 71.56 | 1453.8 | 64.93 | 1788.6 | 2239.0 |
| Dehydrated food products | 189.4 | 15.68 | 45.8 | 11.67 | 231.6 | 19.18 | 55.6 | 14.16 | 1207.5 | 392.7 |
| Pickles, sauces, and salad dressing | 655.9 | 89.43 | 946.6 | 44.64 | 678.8 | 92.54 | 1025.4 | 48.35 | 733.5 | 2120.6 |
| Fresh or frozen packaged fish | 2496.0 | 94.12 | 1017.3 | 85.19 | 2574.4 | 97.08 | 1062.1 | 88.94 | 2651.9 | 1194.1 |
| Frozen fruits, juices, and vegetables | 673.0 | 61.60 | 980.6 | 56.88 | 841.1 | 76.98 | 1285.5 | 74.57 | 1092.6 | 1723.9 |
| Frozen specialties | 80.8 | 83.63 | 256.3 | 59.11 | 85.9 | 88.92 | 288.0 | 66.43 | 96.6 | 433.5 |
| Flour and other grain mill products | 150.6 | 3.76 | 138.9 | 3.75 | 161.2 | 4.02 | 154.1 | 4.16 | 4007.1 | 3702.7 |
| Cereal preparations | 27.7 | 42.69 | 186.3 | 23.72 | 63.8 | 98.35 | 287.0 | 36.54 | 64.8 | 785.4 |
| Blended and prepared flour | 96.1 | 24.72 | 51.0 | 17.93 | 106.5 | 27.40 | 61.3 | 21.54 | 388.6 | 284.4 |
| Dog, cat, and other pet food | 0.0 | 0.00 | 35.1 | 8.08 | 31.7 | 12.23 | 76.1 | 17.53 | 259.2 | 434.3 |
| Prepared feeds | 0.0 | 0.00 | 17.5 | 0.20 | 0.0 | 0.00 | 38.1 | 0.44 | 11008.6 | 8655.9 |
| Rice milling | 40.9 | 16.40 | 57.9 | 14.06 | 49.6 | 19.87 | 70.9 | 17.21 | 249.5 | 412.0 |
| Wet corn milling | 0.5 | 0.02 | 18.2 | 2.04 | 1.3 | 0.04 | 30.5 | 3.41 | 2874.8 | 893.6 |
| Bread, cake, and related products | 3007.4 | 89.89 | 3739.2 | 84.95 | 3237.1 | 96.76 | 4072.2 | 92.52 | 3345.5 | 4401.7 |
| Cookies and crackers | 248.4 | 65.89 | 426.8 | 62.61 | 305.0 | 80.93 | 511.8 | 75.08 | 376.9 | 681.7 |

(continued)

**Table 1. continued**

| Commodities[c] | Eating and Drinking Places | | | | Total Food-Away-From-Home | | | | Total Intermediate Use | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1977 | % of[a] 77 TIU | 1990 | % of 90 TIU | 1977 | % of 77 TIU | 1990 | % of 90 TIU | 1977 | 1990 |
| Sugar | 170.8 | 2.70 | 61.0 | 2.15 | 192.3 | 3.04 | 71.4 | 2.51 | 6331.8 | 2842.3 |
| Confectionery products | 233.5 | 35.29 | 263.4 | 27.44 | 245.8 | 37.15 | 285.4 | 29.73 | 661.7 | 959.8 |
| Chocolate and cocoa products | 45.8 | 6.30 | 127.8 | 18.89 | 48.3 | 6.64 | 139.7 | 20.65 | 726.2 | 676.4 |
| Chewing gum | 0.0 | 0.00 | 3.8 | 2.71 | 0.0 | 0.00 | 15.1 | 10.65 | 115.7 | 141.9 |
| Malt liquors | 2332.1 | 88.60 | 4352.4 | 82.47 | 2333.6 | 88.65 | 4355.8 | 82.54 | 2632.2 | 5277.3 |
| Malt | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 632.1 | 350.7 |
| Wines, brandy, and brandy spirits | 623.1 | 55.21 | 1088.1 | 46.17 | 631.2 | 55.92 | 1099.6 | 46.66 | 1128.7 | 2356.6 |
| Distilled liquor, except brandy | 2011.9 | 67.11 | 1533.9 | 70.64 | 2078.4 | 69.33 | 1560.8 | 71.88 | 2997.8 | 2171.5 |
| Bottled and canned soft drinks | 2846.4 | 92.12 | 5722.1 | 86.10 | 2909.8 | 94.17 | 5897.7 | 88.74 | 3089.9 | 6645.9 |
| Flavoring extracts and syrups | 859.1 | 29.81 | 127.9 | 9.36 | 869.7 | 30.18 | 141.1 | 10.33 | 2881.9 | 1366.0 |
| Cottonseed oil mills | 0.0 | 0.00 | 9.2 | 1.55 | 0.0 | 0.00 | 9.8 | 1.67 | 462.2 | 591.3 |
| Soybean oil mills | 0.0 | 0.00 | 367.7 | 6.41 | 0.0 | 0.00 | 396.7 | 6.91 | 3846.5 | 5738.5 |
| Vegetable oil mills | 0.0 | 0.00 | 13.6 | 19.12 | 0.0 | 0.00 | 16.2 | 22.90 | 917.0 | 70.9 |
| Animal and marine fats and oils | 0.0 | 0.00 | 59.8 | 3.20 | 0.0 | 0.00 | 69.0 | 3.70 | 1795.3 | 1865.5 |
| Roasted coffee | 1098.2 | 85.44 | 23.5 | 9.13 | 1256.0 | 97.71 | 43.3 | 16.78 | 1285.3 | 257.9 |
| Shortening and cooking oils | 824.6 | 25.41 | 168.0 | 7.98 | 867.3 | 26.73 | 181.1 | 8.60 | 3244.7 | 2106.7 |
| Manufactured ice | 0.0 | 0.00 | 0.5 | 0.82 | 0.0 | 0.00 | 0.5 | 0.82 | 35.6 | 66.1 |
| Macaroni and spaghetti | 53.9 | 39.96 | 79.9 | 35.62 | 61.4 | 45.55 | 93.8 | 41.80 | 134.8 | 224.4 |
| Food preparations | 1117.4 | 56.80 | 1619.3 | 42.10 | 1248.0 | 63.44 | 1865.2 | 48.49 | 1967.3 | 3846.2 |
| Total food and kindred products[b] | 34644.2 | 34.95 | 40935.8 | 37.29 | 37781.4 | 38.11 | 45337.6 | 41.30 | 99126.0 | 109763.2 |
| Wholesale trade | 6737.0 | 5.14 | 7946.8 | 5.44 | 10013.4 | 7.64 | 15022.7 | 10.28 | 131113.0 | 146181.5 |
| Retail trade | 92.8 | 0.41 | 105.7 | 0.46 | 364.1 | 1.61 | 601.3 | 2.60 | 22614.7 | 23099.1 |
| Hotels and lodging places | 19.0 | 0.25 | 731.0 | 3.31 | 686.9 | 9.03 | 3501.9 | 15.85 | 7607.6 | 22094.8 |
| Eating and drinking places | 216.0 | 0.71 | 308.2 | 0.64 | 2820.7 | 9.33 | 4788.3 | 9.97 | 30222.8 | 48031.2 |
| Health | 0.0 | 0.00 | 0.0 | 0.00 | 3462.8 | 76.88 | 7332.7 | 71.85 | 4503.8 | 10204.9 |
| Education | 0.0 | 0.00 | 0.0 | 0.00 | 16.4 | 1.74 | 13.6 | 0.86 | 939.0 | 1572.3 |
| Social services | 212.8 | 5.03 | 454.0 | 5.44 | 795.2 | 18.78 | 1154.4 | 13.83 | 4233.7 | 8345.9 |
| Rest of the world industries | 21621.4 | 1.17 | 43432.9 | 1.55 | 96713.4 | 5.21 | 230980.0 | 8.25 | 185179.5 | 2800136.7 |
| Total industries input | 66104.9 | 2.88 | 96212.1 | 2.91 | 155663.6 | 6.79 | 311748.1 | 9.44 | 2292107.1 | 3302982.1 |

[a]TIU: total intermediate use.

[b]Total food and kindred products is the total of commodities meat packing plants through food preparations.

[c]For the distribution of output of a commodity, read the row for that commodity; for the composition of inputs to an industry, read the column for that industry.

**Table 2. Changes in U.S. intermediate commodities used by the food-away-from-home industry, 1977 and 1990 (millions of 1982 dollars)**

| Commodities[b] | Eating and Drinking Places | | | Total Food-Away-From-Home | | | Total Intermediate Use | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1977 | 1990 | % Change 1977-90 | 1977 | 1990 | % Change 1977-90 | 1977 | 1990 | % Change 1977-90 |
| Livestock & livestock products | 605.9 | 288.8 | −52.33 | 724.6 | 352.6 | −51.34 | 64643.5 | 62660.1 | −3.07 |
| Other agriculture products | 944.2 | 1023.7 | 8.42 | 1094.3 | 1252.6 | 14.47 | 52222.6 | 46542.3 | −10.88 |
| Forestry & fishery products & services | 1011.7 | 985.1 | −2.63 | 1190.6 | 1410.3 | 18.45 | 19700.8 | 24350.0 | 23.60 |
| Meat packing plants | 6368.4 | 8228.0 | 29.20 | 7002.9 | 9271.0 | 32.39 | 16360.1 | 19039.3 | 16.38 |
| Sausages & other prepared meat products | 2074.4 | 1122.0 | −45.91 | 2289.2 | 1248.4 | −45.47 | 3225.2 | 1964.5 | −39.09 |
| Poultry dressing plants | 883.4 | 1379.7 | 56.18 | 1005.8 | 1603.7 | 59.45 | 1706.2 | 4608.7 | 170.12 |
| Poultry & egg processing | 127.7 | 105.2 | −17.59 | 136.5 | 115.3 | −15.57 | 466.3 | 513.7 | 10.18 |
| Creamery butter | 487.3 | 276.8 | −43.19 | 532.8 | 304.8 | −42.80 | 870.4 | 968.6 | 11.29 |
| Cheese, natural and processed | 816.3 | 1545.4 | 89.32 | 857.1 | 1679.9 | 96.01 | 2718.0 | 6308.7 | 132.10 |
| Condensed and evaporated milk | 389.7 | 744.7 | 91.09 | 409.6 | 867.8 | 111.88 | 2013.6 | 3017.4 | 49.85 |
| Ice cream and frozen desserts | 946.2 | 671.1 | −29.07 | 1013.9 | 740.2 | −27.00 | 1041.2 | 883.4 | −15.16 |
| Fluid milk | 1190.6 | 1803.2 | 51.45 | 1620.7 | 2264.4 | 39.72 | 5144.4 | 5777.5 | 12.31 |
| Canned and cured sea foods | 311.0 | 23.1 | −92.58 | 362.6 | 29.4 | −91.90 | 383.9 | 95.9 | −75.01 |
| Canned specialties | 123.5 | 373.7 | 202.53 | 160.7 | 498.0 | 209.84 | 164.3 | 673.9 | 310.04 |
| Canned fruits and vegetables | 1042.1 | 1123.4 | 7.80 | 1279.9 | 1453.8 | 13.59 | 1788.6 | 2239.0 | 25.19 |
| Dehydrated food products | 189.4 | 45.8 | −75.81 | 231.6 | 55.6 | −75.99 | 1207.5 | 392.7 | −67.48 |
| Pickles, sauces, and salad dressing | 655.9 | 946.6 | 44.32 | 678.8 | 1025.4 | 51.07 | 733.5 | 2120.6 | 189.12 |
| Fresh or frozen packaged fish | 2496.0 | 1017.3 | −59.24 | 2574.4 | 1062.1 | −58.75 | 2651.9 | 1194.1 | −54.97 |
| Frozen fruits, juices, and vegetables | 673.0 | 980.6 | 45.70 | 841.1 | 1285.5 | 52.83 | 1092.6 | 1723.9 | 57.78 |
| Frozen specialties | 80.8 | 256.3 | 217.27 | 85.9 | 288.0 | 235.33 | 96.6 | 433.5 | 348.85 |
| Flour and other grain mill products | 150.6 | 138.9 | −7.76 | 161.2 | 154.1 | −4.37 | 4007.1 | 3702.7 | −7.60 |
| Cereal preparations | 27.7 | 186.3 | 573.07 | 63.8 | 287.0 | 350.09 | 64.8 | 785.4 | 1111.40 |
| Blended and prepared flour | 96.1 | 51.0 | −46.90 | 106.5 | 61.3 | −42.45 | 388.6 | 284.4 | −26.80 |
| Dog, cat, and other pet food | 0.0 | 35.1 | | 31.7 | 76.1 | 140.13 | 259.2 | 434.3 | 67.54 |
| Prepared feeds | 0.0 | 17.5 | | 0.0 | 38.1 | | 11008.6 | 8655.9 | −21.37 |
| Rice milling | 40.9 | 57.9 | 41.56 | 49.6 | 70.9 | 43.05 | 249.5 | 412.0 | 65.17 |
| Wet corn milling | 0.5 | 18.2 | 3239.34 | 1.3 | 30.5 | 2295.07 | 2874.8 | 893.6 | −68.92 |
| Bread, cake, and related products | 3007.4 | 3739.2 | 24.33 | 3237.1 | 4072.2 | 25.80 | 3345.5 | 4401.7 | 31.57 |
| Cookies and crackers | 248.4 | 426.8 | 71.86 | 305.0 | 511.8 | 67.79 | 376.9 | 681.7 | 80.87 |

(continued)

**Table 2. continued**

| Commodities[b] | Eating and Drinking Places | | | Total Food-Away-From-Home | | | Total Intermediate Use | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1977 | 1990 | % Change 1977-90 | 1977 | 1990 | % Change 1977-90 | 1977 | 1990 | % Change 1977-90 |
| Sugar | 170.8 | 61.0 | −64.29 | 192.3 | 71.4 | −62.86 | 6331.8 | 2842.3 | −55.11 |
| Confectionery products | 233.5 | 263.4 | 12.79 | 245.8 | 285.4 | 16.09 | 661.7 | 959.8 | 45.06 |
| Chocolate and cocoa products | 45.8 | 127.8 | 179.09 | 48.3 | 139.7 | 189.49 | 726.2 | 676.4 | −6.87 |
| Chewing gum | 0.0 | 3.8 | | 0.0 | 15.1 | | 115.7 | 141.9 | 22.68 |
| Malt liquors | 2332.1 | 4352.4 | 86.63 | 2333.6 | 4355.8 | 86.66 | 2632.2 | 5277.3 | 100.49 |
| Malt | 0.0 | 0.0 | | 0.0 | 0.0 | | 632.1 | 350.7 | −44.51 |
| Wines, brandy, and brandy spirits | 623.1 | 1088.1 | 74.62 | 631.2 | 1099.6 | 74.22 | 1128.7 | 2356.6 | 108.79 |
| Distilled liquor, except brandy | 2011.9 | 1533.9 | −23.76 | 2078.4 | 1560.8 | −24.91 | 2997.8 | 2171.5 | −27.56 |
| Bottled and canned soft drinks | 2846.4 | 5722.1 | 101.03 | 2909.8 | 5897.7 | 102.68 | 3089.9 | 6645.9 | 115.09 |
| Flavoring extracts and syrups | 859.1 | 127.9 | −85.11 | 869.7 | 141.1 | −83.77 | 2881.9 | 1366.0 | −52.60 |
| Cottonseed oil mills | 0.0 | 9.2 | | 0.0 | 9.8 | | 462.2 | 591.3 | 27.92 |
| Soybean oil mills | 0.0 | 367.7 | | 0.0 | 396.7 | | 3846.5 | 5738.5 | 49.19 |
| Vegetable oil mills | 0.0 | 13.6 | | 0.0 | 16.2 | | 917.0 | 70.9 | −92.27 |
| Animal and marine fats and oils | 0.0 | 59.8 | | 0.0 | 69.0 | | 1795.3 | 1865.5 | 3.91 |
| Roasted coffee | 1098.2 | 23.5 | −97.86 | 1256.0 | 43.3 | −96.55 | 1285.3 | 257.9 | −79.94 |
| Shortening and cooking oils | 824.6 | 168.0 | −79.63 | 867.3 | 181.1 | −79.12 | 3244.7 | 2106.7 | −35.07 |
| Manufactured ice | 0.0 | 0.5 | | 0.0 | 0.5 | | 35.6 | 66.1 | 85.32 |
| Macaroni and spaghetti | 53.9 | 79.9 | 48.39 | 61.4 | 93.8 | 52.74 | 134.8 | 224.4 | 66.46 |
| Food preparations | 1117.4 | 1619.3 | 44.91 | 1248.0 | 1865.2 | 49.46 | 1967.3 | 3846.2 | 95.51 |
| Total food and kindred products[a] | 34644.2 | 40935.8 | 18.16 | 37781.4 | 45337.6 | 20.00 | 99126.0 | 109763.2 | 10.73 |
| Wholesale trade | 6737.0 | 7946.8 | 17.96 | 10013.4 | 15022.7 | 50.03 | 131113.0 | 146181.5 | 11.49 |
| Retail trade | 92.8 | 105.7 | 13.94 | 364.1 | 601.3 | 65.14 | 22614.7 | 23099.1 | 2.14 |
| Hotels and lodging places | 19.0 | 731.0 | 3754.86 | 686.9 | 3501.9 | 409.81 | 7607.6 | 22094.8 | 190.43 |
| Eating and drinking places | 216.0 | 308.2 | 42.70 | 2820.7 | 4788.3 | 69.75 | 30222.8 | 48031.2 | 58.92 |
| Health | 0.0 | 0.0 | | 3462.8 | 7332.7 | 111.76 | 4503.8 | 10204.9 | 126.58 |
| Education | 0.0 | 0.0 | | 16.4 | 13.6 | −17.11 | 939.0 | 1572.3 | 67.44 |
| Social services | 212.8 | 454.0 | 113.34 | 795.2 | 1154.4 | 45.16 | 4233.7 | 8345.9 | 97.13 |
| Rest of the world industries | 21621.4 | 43432.9 | 100.88 | 96713.4 | 230980.0 | 138.83 | 185579.5 | 2800136.7 | 50.94 |
| Total industries input | 66104.9 | 96212.1 | 45.54 | 155663.6 | 311748.1 | 100.27 | 2292107.1 | 3302982.1 | 44.10 |

[a]Total food and kindred products is the total of commodities meat packing plants through food preparations.

[b]For the distribution of output of a commodity, read the row for that commodity; for the composition of inputs to an industry, read the column for that industry.

show that food and kindred products made up 42.6 percent of intermediate industry inputs in 1990 to eating and drinking places, which was down from 52.4 percent in 1977 (Table 3). The declining relative importance of food input is consistent with the increasing importance of other industry input into food service. These other industry inputs include such things as equipment, financing, advertising, medical costs, and the like.

The data by column do not include value added to the intermediate products before they become consumer products. Value added includes primary labor and capital input, plus indirect business taxes. After adding value, food and kindred products comprised 21.8 percent of total output in 1990, down from 28.1 percent in 1977. These figures imply a sizable increase in labor costs known to have affected the sale at retail level of all food products. Value added itself increased from 46.3 to 48.7 percent of total output for food and kindred products.

### Share of Personal Consumption Expenditures

Another recent input-output study showed processed food output used in selected personal consumption expenditure (PCE) categories in the national income and product accounts (Lee 1990).[13] These categories included food-away-from-home (defined as purchased meals and beverages) and food-at-home (defined as off-premise consumption).[14] The processed food output included ten major, processed- food industry groups. The data focused on changes between 1972 and 1982 in real dollars.

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[13]The procedure involves use of a "bridge matrix" made available as a special tabulation of input-output data from the Commerce Department, which allows bridging the intermediate output use data in terms of individual industries and final output measured as detailed categories of PCE. The data will soon be available for 1982.

[14]Processed food input into two other food categories were included: food for employees and food consumed by farm households. In addition, processed food inputs separated into four nonfood categories of personal consumption expenditures were also included: clothing, shoes, tobacco, and flowers.

Table 4 shows a summary of the changes between 1972 and 1982 in terms of food industry contributions to food-at-home and food-away-from-home sectors of the PCE. The data are expressed in terms of percentage changes in contributions to PCE and are derived from data expressed in 1977 dollars. In this case, the data show total uses rather than intermediate uses, by use of a "bridge table" from the Commerce Department, as discussed in footnote 14.

The data in Table 4 emphasize the marginal importance of various food sources to food-away-from-home relative to food-at-home and focus on changes over time. Use of meat products and fats and oils stand out as being of greatest importance among the food industries. But, beverages, fruits and vegetables, and dairy products also contribute importantly to food-away-from-home spending.

### Policy Implications

Based on evidence from these data, the policy implications are great. Agricultural economists and policy-makers have long thought of food stores as being the dominant marketing conduit for their products on the way to consumers. However, for many products this concept is no longer true. Restaurants, hotels, and institutions dominate the sale of many primary food products.

Most food processors and manufacturers likely already know that this situation exists, because they know the composition of their own markets. But, farmers and ranchers probably do not know the situation, and food and agriculture policymakers obviously do not know. They hardly recognize that the food service industry exists, in terms of food policy actions.

There appears to be little dialogue between food service leaders and agricultural policymakers, and little realization of their joint interests. The food service industry itself is more concerned with consumer issues, employee shortages (at least prior to the recession), and other labor-management issues, and

**Table 3. U.S. intermediate commodities inputs into eating and drinking places, 1977 and 1990 (millions of 1982 dollars)**

| | Eating and Drinking Places | | | |
|---|---|---|---|---|
| Commodities[c] | 1977 | % of 1977 TIU[a] | 1990 | % of 1990 TIU |
| Livestock & livestock products | 605.9 | 0.92 | 288.8 | 0.30 |
| Other agriculture products | 944.2 | 1.43 | 1023.7 | 1.06 |
| Forestry & fishery products & Services | 1011.7 | 1.53 | 985.1 | 1.02 |
| Meat packing plants | 6368.4 | 9.63 | 8228.0 | 8.55 |
| Sausages & other prepared meat products | 2074.4 | 3.14 | 1122.0 | 1.17 |
| Poultry dressing plants | 883.4 | 1.34 | 1379.7 | 1.43 |
| Poultry & egg processing | 127.7 | 0.19 | 105.2 | 0.11 |
| Creamery butter | 487.3 | 0.74 | 276.8 | 0.29 |
| Cheese, natural and processed | 816.3 | 1.23 | 1545.4 | 1.61 |
| Condensed and evaporated milk | 389.7 | 0.59 | 744.7 | 0.77 |
| Ice cream and frozen desserts | 946.2 | 1.43 | 671.1 | 0.70 |
| Fluid milk | 1190.6 | 1.80 | 1803.2 | 1.87 |
| Canned and cured sea foods | 311.0 | 0.47 | 23.1 | 0.02 |
| Canned specialties | 123.5 | 0.19 | 373.7 | 0.39 |
| Canned fruits and vegetables | 1042.1 | 1.58 | 1123.4 | 1.17 |
| Dehydrated food products | 189.4 | 0.29 | 45.8 | 0.05 |
| Pickles, sauces, and salad dressing | 655.9 | 0.99 | 946.6 | 0.98 |
| Fresh or frozen packaged fish | 2496.0 | 3.78 | 1017.3 | 1.06 |
| Frozen fruits, juices, and vegetables | 673.0 | 1.02 | 980.6 | 1.02 |
| Frozen specialties | 80.8 | 0.12 | 256.3 | 0.27 |
| Flour and other grain mill products | 150.6 | 0.23 | 138.9 | 0.14 |
| Cereal preparations | 27.7 | 0.04 | 186.3 | 0.19 |
| Blended and prepared flour | 96.1 | 0.15 | 51.0 | 0.05 |
| Dog, cat, and other pet food | 0.0 | 0.00 | 35.1 | 0.04 |
| Prepared feeds | 0.0 | 0.00 | 17.5 | 0.02 |
| Rice milling | 40.9 | 0.06 | 57.9 | 0.06 |
| Wet corn milling | 0.5 | 0.00 | 18.2 | 0.02 |
| Bread, cake, and related products | 3007.4 | 4.55 | 3739.2 | 3.89 |
| Cookies and crackers | 248.4 | 0.38 | 426.8 | 0.44 |
| Sugar | 170.8 | 0.26 | 61.0 | 0.06 |
| Confectionery products | 233.5 | 0.35 | 263.4 | 0.27 |
| Chocolate and cocoa products | 45.8 | 0.07 | 127.8 | 0.13 |
| Chewing gum | 0.0 | 0.00 | 3.8 | 0.00 |
| Malt liquors | 2332.1 | 3.53 | 4352.4 | 4.52 |
| Malt | 0.0 | 0.00 | 0.0 | 0.00 |
| Wines, brandy, and brandy spirits | 623.1 | 0.94 | 1088.1 | 1.13 |
| Distilled liquor, except brandy | 2011.9 | 3.04 | 1533.9 | 1.59 |
| Bottled and canned soft drinks | 2846.4 | 4.31 | 5722.1 | 5.95 |
| Flavoring extracts and syrups | 859.1 | 1.30 | 127.9 | 0.13 |
| Cottonseed oil mills | 0.0 | 0.00 | 9.2 | 0.01 |
| Soybean oil mills | 0.0 | 0.00 | 367.7 | 0.38 |

(continued)

**Table 3. continued**

| Commodities[c] | Eating and Drinking Places | | | |
|---|---|---|---|---|
| | 1977 | % of 1977 TIU[a] | 1990 | % of 1990 TIU |
| Vegetable oil mills | 0.0 | 0.00 | 13.6 | 0.01 |
| Animal and marine fats and oils | 0.0 | 0.00 | 59.8 | 0.06 |
| Roasted coffee | 1098.2 | 1.66 | 23.5 | 0.02 |
| Shortening and cooking oils | 824.6 | 1.25 | 168.0 | 0.17 |
| Manufactured ice | 0.0 | 0.00 | 0.5 | 0.00 |
| Macaroni and spaghetti | 53.9 | 0.08 | 79.9 | 0.08 |
| Food preparations | 1117.4 | 1.69 | 1619.3 | 1.68 |
| Total food and kindred products[b] | 34644.2 | 52.41 | 40935.8 | 42.55 |
| Wholesale trade | 6737.0 | 10.19 | 7946.8 | 8.26 |
| Retail trade | 92.8 | 0.14 | 105.7 | 0.11 |
| Hotels and lodging places | 19.0 | 0.03 | 731.0 | 0.76 |
| Eating and drinking places | 216.0 | 0.33 | 308.2 | 0.32 |
| Health | 0.0 | 0.00 | 0.0 | 0.00 |
| Education | 0.0 | 0.00 | 0.0 | 0.00 |
| Social services | 212.8 | 0.32 | 454.0 | 0.47 |
| Rest of the world industries | 21621.4 | 32.71 | 43432.9 | 45.14 |
| Total industries input | 66104.9 | 100.00 | 96212.1 | 100.00 |

[a]TIU: Total intermediate use.
[b]Total food and kindred products is the total of commodities meat packing plants through food preparations.
[c]For the distribution of output of a commodity, read the row for that commodity; for the composition of input to an industry, read the column for that industry.

rising costs of inputs other than food. They appear to have relatively little interest in food purchasing. They are quite concerned with the costs or potential costs of such things as mandated health insurance, rising minimum wages, and potential requirements for nutrition labeling on food service products. After all, food typically constitutes less than one-third of all restaurant costs, and the percentage is declining, based on these data.

No one appears to be particularly concerned with the potential impact of the quite substantial changes taking place in the structure of the food service industry and their suppliers. Industry concentration is not particularly high as typically measured, even though increases have been quite substantial.[15] However, if one allows for the sales of franchises and compares the business of the largest food service systems, national concentration in food service is growing and is quite comparable to that of the retail food business.[16]

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[15]Census data for 1987 show the top four firms with 8.1 percent of the business, up from 4.5 percent 10 years earlier in 1977. The top 20 firms had 17.0 percent of the business in 1987, compared with 12.4 percent 10 years earlier (Hiemstra 1991).
[16]In terms of systemwide sales, the top four firms had 15.3 percent of eating place sales in 1980 and 18.9 percent in 1987. The top 20 firms had 31 percent of the business in 1980 compared with 35 percent in 1987. Franchising accounts for about 43 percent of sales, and about 71 percent of the franchisee business is owned by the franchisees.

**Table 4. Processed food group contributions to changes in personal consumption expenditures for food, 1972-1982 (1972 dollars)**

| Processed Foods[a] | Food-at-Home (percent) | Food-Away (percent) | Total Food (percent) |
|---|---|---|---|
| Meat products | 25.3 | 63.6 | 100.0 |
| Dairy products | 60.1 | 42.9 | 100.0 |
| Canning, freezing, dehydration | 66.2 | 46.3 | 100.0 |
| Feed & flour milling | 92.5 | 6.7 | 100.0 |
| Prepared feeds (nec.) | 55.1 | 37.9 | 100.0 |
| Fats & oils mills | 13.3 | 77.4 | 100.0 |
| Beverages & flavorings | 51.1 | 49.4 | 100.0 |
| Misc. food processing | 89.7 | 7.1 | 100.0 |

[a]Two industry groups were omitted because they showed negative changes in real dollars of PCE between 1972 and 1982: sugar; and confectionery products, bakery, and macaroni. In both cases, the contribution of food-away-from-home was positive but for food-at-home was negative to a greater extent.

SOURCE: Lee 1990.

Among the other issues that should be of interest to agriculture and agricultural policymakers is the rapidly changing structure and increasing concentration in the wholesale market for food service products. Only four or five food service distributors dominate this market nationally. These companies are among the most profitable in the nation. But, whether this market is economically competitive is an open question. This question should be of some concern to agricultural producers, whose products are being marketed, as well as to the food service industry that is buying the products.

The food service industry is not integrated back into food wholesaling as is the case for the retail food industry. With few exceptions, food is bought from food service distributors who perform the traditional wholesaling function. Some of these purchase contracts, however, are long-term arrangements for closely specified products.

There appears to be little policy concern for the economic efficiency of food sold through food service distributors to the food service industry. And, perhaps, there is no cause for concern. But, recognizing the historically heavy concern for the actions of retail food chains, one wonders if the current market is well understood.

## Conclusions

This paper points to the pressing need for data in order to better understand the market for food ultimately sold through the food service (food-away-from-home) industry. Some alternative potential data sources are reviewed for measuring amounts and kinds of food either purchased or sold through food service.

One recommendation is to request the Census of Wholesale Trade to separate sales by food processors and manufacturers to food service distributors and sales to other general-line wholesalers. The industry is largely segmented on this basis but the data do not reflect this stratification.

Other potentially useful data for demand analysis are consumer purchases from various food service industries, as collected by CREST.

This study developed preliminary data on the percentages of distribution of a broad variety of food processor and manufacturer products to five major categories of food-away-from-home. Food service is growing in importance as evidenced by the increased share of the total intermediate output of food and kindred product industries which went into food-away-from-home industries in 1990. In fact, food service dominates the sale of many important categories of food products.

The figure for 1990 approaches the 45 percent of personal consumption expenditures for food away from home reported by U.S. Department of Commerce data.

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## Appendix 1: Methodology of I-O Analysis of 1977 and 1990 Data

(See notes at end for abbreviations used.)

1. Deriving 1977, 1982, and 1985 I-O coefficient tables:

$$A_{ij} = U_{ij} / TIO_j$$

$A_{ij}$    commodity-by-industry coefficients matrix (57x56)

$U_{ij}$    commodity-by-industry transaction matrix (56x56)

$TIO_j$   row vector of total amount of each industry output (1x56)

2. Deriving 1977, 1982, and 1985 final demand coefficients:

$$B_{ij} = FD_{ij} / TFD_j$$

$B_{ij}$    commodity-by-final demands coefficient matrix (56x4)

$FD_{ij}$   commodity-by-final demands transaction matrix (56x4)

$TFD_j$   row vector of total amount of each final demand output (1x56)

3. Calculating 1977, 1982, and 1985 value added coefficients by rows:

$$C_j = VA_j / TVA$$

$C_j$    row vector of value added coefficients of each industry (1x56)

$VA_j$   row vector of amount of value added of each industry (1x56)

TVA   total value added

$$TVA = \sum_{j=1}^{56} VA_j = GNP$$

4. Applying 1990 GNP to derive 1990 I-O VA, FD, U, TII, TVA, TIU, TFD and TIO:

Since, GNP = TVA = TFD, it follows that:

$$VA_j = GNP * C_j$$

$$TIO_j = VA_j / C_j$$

$$U_{ij} = TIO_j * A_{ij}$$

$$FD_{ij} = GNP * B_{ij}$$

$$TII = \sum_{j=1}^{56} = U_{ij}$$

$$TIU_i = TII_j + VA_j$$

$TII_j$   row vector of total intermediate input of each industry (1x56)

$TIU_i$   column vector of total commodity use of each commodity (1x56)

5. Using PPI (1982=100) to adjust each food and kindred product or product group for 1977 and 1990 I-O use tables:

$$77U_{ij(1982=100)} = \frac{77U_{ij(current \, \$)}}{PPI_{(1982=100)}}$$

$$90U_{ij(1982=100)} = \frac{90U_{ij(current \, \$)}}{PPI_{(1982=100)}}$$

### Notes
1. VA—Value added
2. TFD—Total final demand
3. TVA—Total value added
4. GNP—Gross national product
5. TII—Total intermediate input
6. TIU—Total intermediate use
7. TIO—Total industry output
8. TCO—Total commodity output
9. PPI—Producer price indexes