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

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# Relationships between Food Away from Home and Food at Home: Policy Implications

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By all accounts, Americans have been spending more and more for food away from home. According to the Economic Research Service (ERS) of the U.S. Department of Agriculture, the total expenditures for food away from home (i.e., all meals and snacks purchased, supplied, and donated) increased from $39.6 billion in 1970 to $230.8 billion in 1989, showing an average annual growth rate of 9.7 percent during this period (Manchester 1991). The growth was higher in the 1970s than in the 1980s. Even so, the average annual growth rate of 6.7 percent during 1980 through 1989 is still quite impressive. Other data sources show a similar trend. Based on personal consumption expenditures in national income accounts, the Bureau of Economic Analysis estimated the total expenditure for food away from home (i.e., purchased meals and snacks) increased from $56.2 billion in 1977 to $131.1 billion in 1986, representing an average annual growth rate of 9.9 percent. Using the Continuing Consumer Expenditure Survey (CCES) data provided by the Bureau of Labor Statistics (BLS), Gieseman (1987) estimated that the total expenditures for food away from home (FAFH) in the U.S. increased from $58.8 billion in 1980 to $85.5 billion in 1986 with an average rate of increase of 9.8 percent per year. Using the diary segment of the CCES, he estimated the total food away from home expenditures at $76.64 billion in 1980 and $107.87 billion in 1984, reflecting an average rate of increase at 8.9 percent per year.

Even though an increasing trend of the food away from home expenditures is clearly evident from these statistics, the estimates vary depending on the method and definition in data collection. The FAFH sector involves a diverse and complex structure for food consumption, which is vastly different from food consumed at home. Unfortunately, the currently available data are mostly limited to aggregate expenditures. Therefore, most of the available studies related to food away from home are based on aggregate expenditure data from either aggregate time series or household surveys.

The objectives of this paper are to briefly analyze the complexity and recent trends of food consumption away from home and its relationship to food at home (FAH), to present a summary of several studies we recently conducted using CCES data, and to analyze the major implications based on these results. For reviewing the literature of the demand studies of FAFH, readers are advised to read a recent paper by Price et al. (1991). A discussion of the major factors such as changing demographic trends, women's participation in the labor force, and the increasing demand for convenience and their effects on FAFH is available in a recent study by Senauer, Asp, and Kinsey (1991).

## Structure and Trends of Food Away from Home

While away from home, people may purchase food and eat in many places. Outlets for FAFH consumption are as diverse as the variety of breakfast cereals in supermarkets. According to the National Restaurant Association (NRA), the food away from home sector can be identified by the type of services and/or management of the place where food is served and sold. Table 1 shows the 1988 food expenditures by aggregate group and by the components under FAFH. The NRA included the bulk of FAFH under the category of eating and drinking places, accounting for 69.23 percent of the expenditure of FAFH in 1988. This category includes restaurants and fast food outlets, which, as combined, accounted for 88 percent of food expenditures in the eating and drinking places classified by the NRA. Expenditures incurred in hotels and motels accounted for 6.23 percent of FAFH in 1988 while institutional organizations sold $23.1 billion worth of food, accounting for 10.82 percent of the FAFH expenditures in 1988. According to this data source, FAFH has total expenditures of $213.5 billion in 1988, accounting for 38.15 percent of total food expenditure. The NRA's estimates are based on sales data. Its estimate of total food expenditures of $559.7 billion in 1988 was higher than total food expenditures estimated by USDA.

The growth of the fast food sector has contributed to the rapid increases in the FAFH consumption during the last two decades. In the aggregate, the fast food sector accounted for 28 percent of the FAFH expenditures in 1988 (Table 1). Table 2 shows the sales of

**Table 1. U.S. total food expenditures and expenditure components for food away from home, 1988**

| Item | Expenditure (in $ billion) | Percent of Total | Percent of FAFH |
|---|---|---|---|
| Total Food | 559.7 | 100.00 | NA |
| Food at Home (FAH) | 346.2 | 61.85 | NA |
| Food Away from Home (FAFH) | 213.5 | 38.15 | 100.00 |
| Eating and Drinking Places | 147.8 | 26.41 | 69.23 |
| Restaurants and Lunchrooms | 70.6 | 12.61 | (33.07) |
| Fast Food Restaurants[a] | 60.4 | 10.79 | (28.29) |
| Commercial Cafeterias[b] | 7.2 | 1.29 | (3.37) |
| Bars and Taverns | 9.6 | 1.71 | (4.50) |
| Hotels and Motels | 13.3 | 2.37 | 6.23 |
| Food at Retail Outlets[c] | 16.6 | 2.96 | 7.78 |
| Food Contractors[d] | 11.5 | 2.05 | 5.39 |
| Institutional Organization[e] | 23.1 | 4.13 | 10.82 |
| Military Food Service | 1.2 | 0.21 | 0.55 |

NA = Not applicable.

[a]Includes all limited menu restaurants and refreshment places.
[b]Includes also social caterers and ice cream or frozen custard stands.
[c]Includes all food service facilities in drug stores, variety, and convenience stores, etc.
[d]Includes those providing food service at plants, schools, hospitals, and other facilities owned by others.
[e]Defined as business, education, government, or institutional organizations that operate their own food service.

SOURCE: Emerson (1990) 17-19

**Table 2. Sales of franchised fast food restaurants**

| Year | Hamburger | Chicken | Pizza | Seafood | Mexican |
|---|---|---|---|---|---|
| | (in $ billion) | | | | |
| 1973 | 4.88 | 1.13 | 0.51 | 0.10 | 0.14 |
| 1974 | 5.88 | 1.26 | 0.71 | 0.15 | 0.18 |
| 1975 | 6.76 | 1.37 | 0.92 | 0.30 | 0.27 |
| 1976 | 8.03 | 1.61 | 1.09 | 0.44 | 0.31 |
| 1977 | 9.10 | 2.09 | 1.42 | 0.58 | 0.50 |
| 1978 | 10.86 | 2.03 | 1.74 | 0.56 | 0.60 |
| 1979 | 12.74 | 2.26 | 2.14 | 0.77 | 0.69 |
| 1980 | 14.03 | 2.73 | 2.46 | 0.79 | 0.88 |
| 1981 | 14.33 | 2.83 | 3.17 | 0.89 | 1.07 |
| 1982 | 16.86 | 2.95 | 3.74 | 0.91 | 1.26 |
| 1983 | 18.95 | 3.42 | 4.65 | 0.94 | 1.68 |
| 1984 | 22.04 | 3.89 | 4.93 | 1.07 | 2.11 |
| 1985 | 23.41 | 4.11 | 6.19 | 1.21 | 2.40 |
| 1986 | 25.16 | 4.38 | 7.46 | 1.36 | 2.89 |
| 1987 | 27.26 | 4.82 | 8.13 | 1.48 | 3.08 |
| 1988 | 30.00 | 5.44 | 9.15 | 1.69 | 3.34 |
| | Average Annual Growth Rates (percent) | | | | |
| 1973-1980 | 16.3 | 13.4 | 25.2 | 34.3 | 30.0 |
| 1980-1988 | 9.97 | 9.0 | 17.8 | 10.0 | 18.1 |

SOURCE: Emerson (1990) 64,67.

franchised fast food restaurants by type of food during 1973 to 1988. Average annual growth rates for 1973 to 1980 and 1980 to 1988 are also presented in this table. Franchised hamburger restaurants are the largest segment of the fast food industry with sales of $30 billion in 1988. This sale volume accounted for 50 percent of total sales in the fast food industry. Among the fastest growing segments of fast food consumption are pizza, seafood, and Mexican food. The sales from these three franchise segments had annual growth rates exceeding 25 percent during 1973 to 1980. The growth slowed somewhat in the 1980s with their growth rates remaining above 10 percent per year.

Data on aggregate FAFH consumption are also provided in the Continuing Consumer Expenditure Survey. The CCES consists of diary and interview surveys; data from these surveys have been available on an annual basis since 1980. The BLS defines FAH and FAFH in the CCES as follows:

**Food at home** refers to the total expenditures for food at grocery stores or other food stores and food prepared by the consumer unit on trips. It excludes the purchase of nonfood items.

**Food away from home** includes all meals (breakfast, lunch, brunch, and dinner) at restaurants, carryouts, and vending machines, including tips, plus meals as pay, special catered affairs such as weddings, bar mitzvahs, and confirmations, and meals away from home on trips (U.S. Bureau of Labor Statistics, 1989).

While these definitions apply to both the interview and diary surveys, the FAFH in the diary survey does not include food expenditures while away from home overnight. Since the two surveys employ different samples and different methods for data collection, the estimates obtained from the two surveys do not always agree with each other. Since 1984, the BLS has integrated the two surveys to provide better estimates of consumer expenditures for selected categories, particularly food expenditures.

Table 3 shows the weekly expenditures for food at home and food away from home obtained from the diary, interview, and integrated surveys during 1980-1988. These data reconfirm the observations from other data sources that (1) the FAFH expenditures have been increasing and (2) the FAFH shares of total food expenditures have also been increasing until very recently when the shares decreased in 1989. Based on the integrated survey, the FAFH accounted for 42.44 percent of total food expenditures in 1989.

## Food Demand Estimation Using BLS's Consumer Expenditure Survey Data

Our further analysis of FAFH consumption is based on the following three studies that we recently conducted using CCES data. The objectives and methodologies of these studies are briefly described here:

**Study A. "Complete Demand Systems of Nondurable Goods and Services" by Chern and Lee (1989a).**

| | |
|---|---|
| Objectives: | (1) To estimate complete demand systems for aggregate expenditure groups.<br>(2) To examine the effects of demographic variables on consumer demand. |
| Data: | BLS's Interview Survey, 1980-1985. Annual average expenditures by five income groups (30 observations). |
| Models: | Linear expenditure system (LES) and quadratic expenditure system (QES). |
| Expenditure Groups: | (1) Food at home, (2) food away from home, (3) housing, (4) apparel, (5) transportation, (6) health care, (7) entertainment, (8) other goods and services. |

**Study B. "Nonparametric and Parametric Analyses of Demand for Food at Home and Away from Home" by Chern and Lee (1989b).**

| | |
|---|---|
| Objectives: | (1) To conduct nonparametric analysis for testing the weak separability of food at home and food away from home.<br>(2) To examine the sensitivity of estimated price elasticities to alternative groupings of expenditure categories. |
| Data: | BLS's Interview Survey, 1980-1986. Annual coverage expenditures by five income groups (35 observations). |
| Methodologies: | (1) Varian's (1983) nonparametric tests and (2) LES and QES |
| Expenditure Groups: | 8 nondurable goods and services as in Study A plus three durable goods that is, (9) housing durables, (10) transportation durables, and (11) entertainment durables. |

**Study C. "Nonparametric and Parametric Analyses of Food Demand in the United States" by Lee (1990).**

| | |
|---|---|
| Objectives: | (1) To construct monthly time-series data from expenditure surveys.<br>(2) To analyze separability and commodity grouping by nonparametric methods.<br>(3) To apply both one-stage and two-stage budgeting procedures for constructing a 19 by 20 elasticities matrix on food demand.<br>(4) To investigate the effects of demographic variables on food consumption. |
| Data: | BLS's Diary Survey, 1980-1986. Monthly average expenditures (84 observations). |
| Methodologies: | Varian (1983) nonparametric tests, factor and cluster analysis, Lewbel's full model, translog, and linear approximate almost ideal demand system (LA/AIDS). |
| Expenditure Groups: | 18 food groups for at-home consumption plus one for food away from home. |

**Table 3. Weekly consumer expenditures of food at home and away from home, 1980-1988**

| | CCES Diary Survey[a] | | | CCES Interview Survey[b] | | | CCES Integrated Survey | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | FAH ($) | FAFH ($) | FAFH Share of Total (%) | FAH ($) | FAFH ($) | FAFH Share of Total (%) | FAH ($) | FAFH ($) | FAFH Share of Total (%) |
| 1980 | 33.08 | 15.77 | 32.27 | 46.12 | 15.13 | 24.71 | [c] | | |
| 1981 | 35.21 | 16.92 | 32.45 | 46.62 | 16.13 | 25.71 | | | |
| 1982 | 35.81 | 19.02 | 34.68 | 42.00 | 17.13 | 28.98 | | | |
| 1983 | 35.21 | 20.17 | 36.42 | 42.77 | 18.73 | 30.46 | | | |
| 1984 | 37.31 | 19.81 | 34.67 | 45.04 | 20.15 | 30.91 | 37.88 | 25.38 | 40.12 |
| 1985 | 38.60 | 21.32 | 35.58 | 44.58 | 20.69 | 31.70 | 39.17 | 27.71 | 41.44 |
| 1986 | 37.73 | 21.87 | 36.69 | 44.48 | 20.17 | 31.19 | 38.32 | 27.98 | 42.20 |
| 1987 | 39.77 | 23.60 | 37.24 | 47.86 | 20.46 | 29.95 | 40.37 | 30.10 | 42.71 |
| 1988 | 40.49 | 24.17 | 37.38 | 55.53 | 21.51 | 27.92 | 41.08 | 31.00 | 43.01 |
| 1989 | 45.32 | 26.16 | 36.60 | 58.72 | 22.97 | 28.12 | 45.96 | 33.88 | 42.44 |

[a]For 1980-1983, the survey included only urban population.
[b]For 1980-1983, the survey included only urban population. For 1984, these published data also were compiled only from the surveyed urban consumer units.
[c]Blanks indicate that data were not published by the Bureau of Labor Statistics.

SOURCES: (1) U.S. Bureau of Labor Statistics 1985, U.S. Bureau of Labor Statistics 1986a, U.S. Bureau of Labor Statistics 1986b, U.S. Bureau of Labor Statistics 1986c, U.S. Bureau of Labor Statistics *News* 1984, U.S. Bureau of Labor Statistics *News* 1986, U.S. Bureau of Labor Statics *News* 1987, U.S. Bureau of Labor Statistics *News* 1989, U.S. Bureau of Labor Statistics *News* 1990. (2) For diary survey, 1986-1989, and interview survey, 1987-1989, estimates were obtained from unpublished sources supplied by William Passero of BLS.

These three studies are interrelated. Studies A and B used BLS's interview survey data to examine the relationship between FAFH and FAH as well as FAFH and other expenditure groups at the aggregate level. These studies may be viewed as attempts to model the first stage of consumer budget allocation among FAFH and other categories. Study C used BLS's diary survey data to examine the relationship between FAFH and other subcategories for food at home. Therefore, the statistical analyses are limited to food only. This may be viewed as an attempt to model the second stage of consumer budget allocation of food dollars.

## Statistical Results and Their Implications

The statistical results obtained from the three above mentioned studies are used as the basis of explaining the changing consumer behavior of food away from home and drawing implications for the food industry and agricultural policy makers. As these studies provide alternative estimates of demand parameters, judgments are made to select the most appropriate sets of estimates for the purpose of this paper.

Most of the food demand studies, including ours, focus on estimating income and price elasticities. Therefore, we will first analyze these estimates and their implications. In addition, we will discuss the results related to demographic variables, the assumption of separability, and commodity grouping.

### Effects of Income and Price

Table 4 presents the estimated expenditure and price elasticities for FAFH and FAH obtained from the three studies. Total expenditures in studies A and B do not include those for durable goods. Therefore, they cannot be equated to income even though they accounted for about 70 percent of total consumption expenditures. Total expenditures in C are total food expenditures and, thus, they represent a component in A and B. In order to obtain comparable estimates of expenditure elasticities, we need the expenditure elasticity with respect to total food. An estimate of 0.84 was obtained from the LA/AIDS model using the interview survey data for 1980 to 1986. This estimate is used to obtain the expenditure elasticities for food away from home presented in parentheses in Table 4.

These estimates of expenditure (income) elasticities show (1) income effects are considerably stronger on FAFH than FAH, (2) the estimated expenditure (income) elasticities for FAFH are mostly higher than unity, and (3) the interview survey data yield higher expenditure elasticities than the diary survey data. It is important to point out that the differences between the interview survey and diary survey are not caused by differences in model specification. There is a major difference and, that is, A and B used annual data and C used monthly data. Furthermore, studies A and B pooled time-series and cross-sectoral data while study C used a single time series. Therefore, the estimated elasticities obtained from A and B would capture long-run effects. As long-run elasticities, their magnitudes should be higher than those obtained from study C.

What implications can we draw from these estimates? The estimates clearly show that as income increases, households demand more food away from home than FAH. Therefore, changes in income would be one important factor explaining the increases in the expenditures of FAFH and its share of total food expenditures. But precisely how much of growth in FAFH during the last two decades can be attributed to income effects? During 1971 to 1988, per capita nominal disposable income in the U.S. increased by 7.96 percent per year. In real terms, the rate of increase was only 1.21 percent per year during this 15-year period. Therefore, income alone cannot explain the rapid growth of FAFH, especially those fast food segments such as pizza, seafood, and Mexican food shown in Table 2. It is likely, of course, different segments of FAFH have different income elasticities. Unfortunately, data currently available are not sufficient for estimating such disaggregate elasticities.

There is another interesting finding related to income effects. Study A also provides estimates of expenditure elasticities by income group (five income quantiles) as shown in Table 5. These estimates show that the demand for FAFH is income elastic for all income

**Table 4. Estimated expenditure and own-price elasticities of food demand**

| Study | Model | Expenditure Elasticities | | Own-Price Elasticities | |
|---|---|---|---|---|---|
| | | FAFH[a] | FAH[b] | FAFH[a] | FAH[b] |
| A | LES | 1.60 | 0.40 | –0.68 | –0.24 |
| | QES | 1.52 | 0.64 | –1.47 | –0.84 |
| B | LES | 1.62 | 0.41 | –0.74 | –0.26 |
| | QES | 1.51 | 0.67 | –1.43 | –0.98 |
| C[c] | Full[d] | 1.01 (0.85)[e] | [f] | –0.27 | [f] |
| | Translog | 1.27 (1.07)[e] | [f] | –0.52 | [f] |
| | LA/AIDS | 1.32 (1.11)[e] | [f] | –0.53 | [f] |

[a]FAFH = Food away from home.
[b]FAH = Food at home.
[c]Based on the first-stage model with FAFH and five other expenditure groups for food at home. Expenditure elasticities are defined with respect to total food expenditure (not income).
[d]Lewbel's full model.
[e]The figures in parentheses are income elasticities computed using the estimated income elasticity of 0.84 for total food, obtained from the LA/AIDS model using BLS's Interview Survey data for 1980 to 1986.
[f]Elasticities for aggregate food at home are not estimated in this study. FAH includes 18 food groups.

**Table 5. Estimated total expenditure elasticities by income group**

| Item | Model | Income Group by Quantiles | | | | |
|---|---|---|---|---|---|---|
| | | 1st | 2nd | 3rd | 4th | 5th |
| Food away from home | LES | 1.69 | 1.78 | 1.64 | 1.59 | 1.39 |
| | QES | 1.60 | 1.70 | 1.59 | 1.45 | 1.52 |
| Food at home | LES | 0.35 | 0.36 | 0.40 | 0.42 | 0.51 |
| | QES | 0.74 | 0.73 | 0.69 | 0.59 | 0.13 |

groups. Furthermore, the five income groups have very similar magnitudes of expenditure elasticities. This pattern is in sharp contrast with that of food at home estimated under QES, showing significant drops of expenditure elasticities for high income groups. The implication is that the strong income effects on FAFH are across all income groups. On the other hand, income effects on FAH diminish in high income groups, especially the 20 percent of households in the highest income group. As American households continue to increase their income, one can expect that they would continue to spend a greater proportion of their income for FAFH but would spend a considerably less proportion for FAH.

Let us examine the estimated price elasticities which are also presented in Table 4. Again the studies based on interview survey yield higher price elasticities (in absolute value) than those obtained from diary survey data. Furthermore, the demand for FAFH appears to have higher price responses than FAH. An elastic demand for FAFH would support the pricing strategies recently adopted by several fast food chains such as Taco Bell and McDonalds.

**Patterns of Substitution**

As the food away from home and food at home provide essentially the same human need for food, one is likely to perceive these two categories of food as most closely related to one another. It is true that if one eats at home, he or she could not simultaneously spend for FAFH. However, the FAFH provides more than just food. Consumers also pay for the food services. In fact, the food services may cost more than food materials for most of the food consumed away from home. Furthermore, there are many choices in the FAFH market. Prices vary tremendously.

Table 6 shows our estimates of Hicksian compensated price elasticities for FAFH and FAH. These elasticities measure the substitutions between FAFH and other aggregate expenditure groups. Note that Table 6 shows only part of a complete price elasticity matrix. These results show that (1) FAFH and FAH have a relatively small Hicksian cross-price elasticity, (2) the strongest substitutes for FAFH are found to be housing and transportation, and (3) FAH has small cross-price elasticities with most of other aggregate expenditure categories. This pattern of compensated cross-price effects implies that FAFH is affected more by the prices of housing and transportation (such as gasoline) than by the price of FAH. This finding also demonstrates a close relationship between the FAFH industry and the other sectors of the economy. When the price of gasoline increases, consumers would consume more of FAFH as a substitution effect. Of course, the high expenditure elasticity of FAFH as estimated may have such a high income effect, yielding a net decrease in the demand for FAFH, as a result of a price increase in gasoline. These results indicate also that the government policies affecting energy prices can also affect the agricultural sector due to the substitution between gasoline and FAFH.

The estimated pattern of substitution between FAFH and FAH is also consistent with the finding from our nonparametric results. Specifically, Varian's nonparametric tests show that FAFH is weakly separable from FAH. Furthermore, FAFH and FAH can be modeled in a complete demand system for the first-stage budgeting. However, the first-stage budgeting process should include a reasonably large number of spending choices. A complete demand system such as LES or QES may not produce reasonable results if it includes only two groups of FAFH and FAH.

**Effects of Demographic Variables**

Since our studies are based on average household expenditures, many demographic variables in the household data could not be included. Only household age and size are included in our models. The results show that household size has a negative effect on FAFH but a positive effect on FAH. This result is consistent with those found by Redman (1980). This relationship means that households with three or four people would consume less FAFH and more FAH than households with one or two people. It is noted that during the last two decades, average household size in the U.S. has been declining. Therefore, the declining household size may have contributed to the growth of FAFH.

Household age is found to have insignificant effects on FAFH. This result may be caused by the fact that the data series used in these studies cover a relatively short period (1980-1986). Therefore, unlike other studies using household data directly, the effects of household age cannot be effectively estimated in our models.

The impacts of demographic variables on FAFH have been studied more extensively by other researchers. In particular, many researchers have attempted to identify the relationship between the value of time and FAFH consumption. For example, McCracken and Brandt (1987) found a positive relationship between the value of time and FAFH expenditures. As

**Table 6. Estimated Hicksian compensated price elasticities for food away from home and food at home**

| Price of | Food Away from Home | Food at Home |
|---|---|---|
| FAFH | –0.474 | 0.046 |
| FAH | 0.046 | –0.478 |
| Housing | 0.117 | 0.032 |
| Apparel | 0.009 | 0.064 |
| Transportation | 0.236 | 0.039 |
| Health Care | 0.093 | –0.005 |
| Entertainment | 0.029 | 0.054 |
| Other Nondurables and Services | 0.054 | 0.114 |

SOURCE: Study A (QES results).

more women participate in the labor force and value of their time increases, FAFH consumption would increase. McCracken and Brandt's results also indicate the importance of distinguishing between FAFH expenditures by eating places, such as restaurants versus fast food facilities. They show that the value of time may be more important than household income in determining the demand for fast food.

## Conclusions

This paper presents a brief analysis of the recent trends of food expenditures between away from home and at-home consumption and analyzes the factors affecting FAFH using BLS's CCES data. The statistical results obtained from three studies are used as the basis for explaining the growth of FAFH during the last two decades.

Income effects on FAFH consumption are very strong in all income groups. Even though some segments in the FAFH sector may have reached the saturated level as some analysts have claimed, the aggregate FAFH consumption would likely increase as income continues to rise in the future. Further, any government policy affecting household income would affect the food away from home sector, particularly the fast food industry. In our studies, the demand for FAFH is found to be very responsive to price changes. The elastic demand for FAFH as estimated (i.e., price elasticity is –1.0 or higher in absolute value) would support the pricing strategies recently adopted by several fast food chains.

The analysis of these economic variables and other demographic variables suggests that the FAFH expenditure and its share of total food dollars will continue to increase in the future. The food that consumers will choose for away from home consumption will affect not only the food service industry, but also American farmers.

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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 preconference 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.

[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.

**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.

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[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 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

[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.

[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.

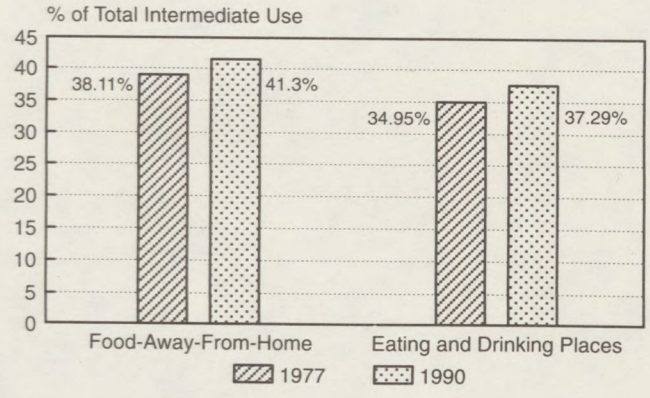


**Figure 1. Food and kindred products used by FAFH, 1977 and 1990**

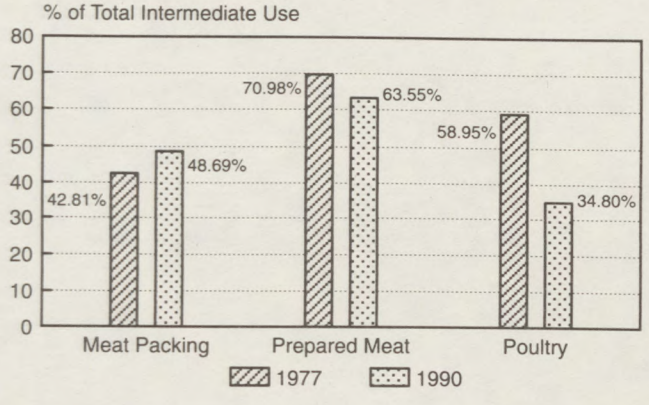


**Figure 2. Meat and poultry products used by FAFH, 1977 and 1990**

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 products 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.

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 policymakers 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

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

| Commodities[c] | Eating and Drinking Places | | | |
|---|---|---|---|---|
| | 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]

[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:

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

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

**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

# Food Assistance Programs
# Effects on Food Demand