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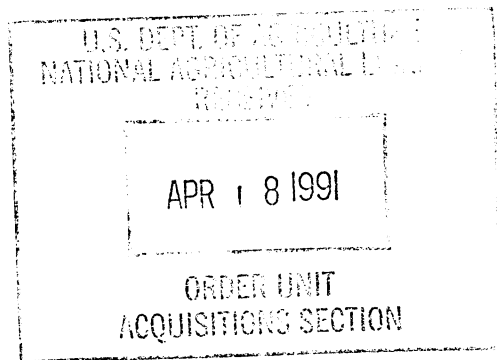
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FOOD DEMAND ANALYSIS
Implications for Future Consumption

Edited by
Oral Capps, Jr. and Benjamin Senauer

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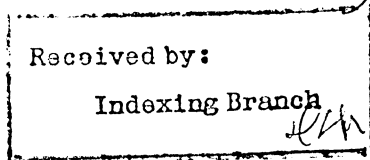


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ANALYSIS OF CONVENIENCE AND NONCONVENIENCE FOOD EXPENDITURES
BY U.S. HOUSEHOLDS WITH PROJECTIONS TO THE YEAR 2000

Oral Capps, Jr. and Joanne M. Pearson¹

Introduction

The food system in the United States has undergone a striking transformation in just a few decades. This transformation is characterized by the emphasis placed on the marketing of services. The notion of the services embodied in food encompasses all aspects of what may be called convenience. Convenience food products transfer the time and activities of preparation from the household manager to the food processor. New products and variations in products have evolved along with the transformation of the food industry to a service industry. In 1976, expenditures on convenience products amounted to nearly \$50 billion (Livingston and Chang (1978)). In 1983, expenditures on convenience products amounted to roughly \$86 billion. This latter figure constitutes the product of the share of the food dollar allocated to convenience foods (approximately 45 percent (Havlicek et al. (1982))) with aggregate consumer expenditures on food and beverages for 1983.

Many kinds of service or convenience are built into the various food products which make up the household shopping list. The purchase of prepared foods obviates the need for much of the homemaker's labor, time and culinary skill. Often the energy costs of preparation are reduced. Multiple ingredient products reduce shopping and planning time as well as storage space requirements when compared to the resources needed by equivalent home-prepared meals. Further, processed product forms may increase shelf life over fresh ingredients and, in some cases, may even improve the quality of the product. Finally, the food processing industry provides products nearly impossible to produce at home, thereby expanding the opportunities of consumers to include goods they would otherwise do without.

Unequivocally, the development of convenience foods is one of the major factors that has shaped the modern food industry. This research is motivated by the need to gain a better understanding of the factors affecting the demand for convenience and nonconvenience foods in the United States. This research deals not only with aggregate convenience and nonconvenience groups, but also with eight food groups delineated by nonconvenience/convenience classifications: (1) beverages, (2) fats and oils, (3) fruits, (4) grains, (5) meat and meat alternates, (6) milk

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equivalents, (7) sugars and sweets, and (8) vegetables. The source of data for this research is the 1977-78 Nationwide Food Consumption Survey. While growth in market volume and variety of convenience foods has been phenomenal, little is known about the factors that affect the expenditure patterns for these foods. The determination of factors that affect expenditure patterns for convenience foods and nonconvenience foods will allow agricultural producers, food processors, and food distributors to anticipate trends in retail markets, improve planning and provide better service to consumers.

Definitions of Convenience and Nonconvenience Foods

Harp and Dunham (1963) defined convenience foods as those "foods which have services added to the basic ingredients to reduce the amount of preparation required in the home." Later, Traub and Odland (1979) defined convenience foods as "any fully or partially prepared foods in which significant preparation time, culinary skills, or energy inputs have been transferred from the home kitchen to the food processor and distributor. Traub and Odland's definition of convenience foods is adopted for the analysis in this research. Nonconvenience foods are nominally defined as fresh (unprocessed) foods, ingredient foods, or home-produced, home-frozen, home-canned, or home-preserved food items. Ingredient foods are processed food products used in food preparation that either cannot be or are not commonly prepared in the home. Examples of convenience and nonconvenience foods by the eight food groups are listed in Table 1.

Model Development

Demographic and life style changes are among the factors that have materially affected the structure of food distribution and the demand for convenience in food products. Income, education level, declining household size and the proportion of women in the civilian work force have cited been by Stafford and Wills (1979) as factors which contribute to the increase in demand (1) for food away from home, (2) for services provided by convenience food stores, and (3) for added convenience in foods purchased for home use.

Based on findings reported by Prochaska and Schrimper (1973) as well as those of Redman (1980), it is hypothesized that household characteristics such as race, region, seasonality, and urbanization are likely to affect food expenditure patterns. Race, region, and population density are controls for differences in ethnic, cultural, and locational backgrounds. Redman provides empirical evidence to indicate that: (1) New England households expend more on prepared foods than do households located in other regions, (2) urban households (outside Standard Metropolitan Statistical Areas) spend more on prepared foods than do households elsewhere, and (3) black households spend significantly less on prepared foods than do non-black households. Redman's findings are adopted as fruitful hypotheses. In the Redman study, prepared foods include such items as prepared flour and cake mixes, bakery products, and canned or frozen meats and dinners.

Table 1. Examples of Convenience and Nonconvenience Foods by Food Group

Food Group	Convenience	Nonconvenience
Beverages	Powdered instant coffee and tea; soft drinks; beer and wine; commercially canned ades, punches, drinks and fruit nectar	Bean or ground coffee; base leaf or bag tea; home canned fruit nectar
Fats and Oils	Soft tub margarine; salad dressings	Cooking oils; vegetable shortening; stick margarine; butter
Fruits	Commercially canned and frozen fruits and fruit juices; commercially canned fruit pie filling	Fresh, home frozen, and home canned fruits
Grains	Ready-to-eat breakfast cereals; quick cooking and instant cereals; biscuit, pancake, cake and cookie mixes; self-rising flour and cornmeal; ready-to-eat and commercially frozen breads, pies, cakes, and cookies	Regular cooking oatmeal flour; cornmeal; rice; macaroni; home frozen pies, cakes, cookies, and waffles
Meat and Meat Alternates	Commercially frozen meat, poultry, and fish; hot dogs; bologna and other luncheon meats; shelled nuts; peanut butter	Fresh eggs; fresh and home frozen meat, poultry, and fish; dry peas and beans
Milk Equivalents	Processed cheese; dry milk and canned condensed and evaporated milk; frozen desserts containing milk	Natural cheeses; fluid whole and skim milk
Sugars and Sweets	Commercially prepared jam and jelly; gum drops and jellybeans	Brown and white sugar; home preserved jam and jelly
Vegetables	Commercially frozen and canned vegetables and vegetable juices; potato chips	Fresh, home canned, and home frozen vegetables

Food preparation accounts for much of the time spent in household production. The purchase of prepared foods obviates the need for some of the household manager's labor, time, and culinary skill. Education level, employment status, and sex of the household manager presumably affect productivity, value, and availability of time, and are therefore likely to be important considerations in making choices among convenience and nonconvenience foods.

Education affects knowledge, skills and attitudes about housework and nutrition. It also affects the value individuals place on their time. In 1960 only 7.7 percent of the population had completed four years or more of college. The percentage rose to 11.0 percent in 1970, and jumped to 17.0 percent by 1980. According to Michael (1972), increases in the education level lead to increases in productivity, not only in the market but also in the home. Gronau (1977) provides empirical evidence to indicate that the household manager's time spent in household production bears a negative relationship to the level of education. Hence, it is hypothesized that college-educated household managers expend more on convenience (nonconvenience) foods than household managers without college education.

Stafford and Wills (1979) hypothesize that increases in the education level and increases in the proportion of females in the work force lead to rightward shifts in the demand for added convenience in foods purchased for preparation at home. When more time is allocated to work in the market, less time is available for home production and leisure. This residual time will become more scarce and hence more valuable as more time is spent outside the home; consequently, household managers may need to rely on services and conveniences built into the products purchased in the market rather than having these produced in the home. Employed household managers are expected to have less discretionary time than unemployed household managers. Thus, it is hypothesized that employed household managers spend more on convenience (nonconvenience) foods than unemployed household managers. Redman substantiates the claim that employed household managers spend more on prepared foods than unemployed household managers.

Males, as household managers, are expected to be less labor efficient than females at meal preparation. Consequently, it is hypothesized that male household managers expend more (less) on convenience (nonconvenience) foods than female household managers.

Additional key characteristics include the distribution of households of various sizes and the distribution of elderly as well as nonelderly households. Single-person households have increased dramatically in the past thirty years. Percentage of single-person households more than doubled from 10.9 percent in 1950 to 22.5 percent in 1980. The growth in the share of two-person households was much more modest, from 28.8 percent to 31.3 percent, over the same period. During the past thirty years there has been a decline in the proportion of more-than-two-person households from 60.3 percent in 1950 to 46.2 percent in 1980. More-than-two-person households are hypothesized to expend more on both nonconvenience and convenience foods than single-

person or two-person households. However, single-person and two-person households are expected to use more convenience foods per person than more-than-two-person households because time for food preparation is scarcer and there is less tendency for a household member to specialize in food preparation. The number of Americans aged 65 and over has doubled in the last three decades, and by the turn of the century, the total of elderly Americans will be approximately 35 million. In 1950, the Census Bureau counted 12.4 million elderly persons, a segment of the population that grew to 25.7 million in 1980. Because of the availability of time for food preparation, elderly households are hypothesized to expend less (more) on convenience (nonconvenience) foods than nonelderly households.

Finally, incomes have risen in the past thirty years. Even in constant (1979) dollars, the median family income in the United States has nearly doubled from \$10,008 in 1950 to \$19,661 in 1979. In undeflated dollars, the median family income was nearly six times as large in 1979 as in 1950. This trend in the growth of family income is expected to continue into the future. The effect of such income growth on food expenditures is likely to increase the share going to services and convenience built into the food products (Stafford and Wills (1979)). All food groups in this analysis are hypothesized to have income elasticities between zero and one. This hypothesis implies that the respective food groups are necessary goods, in lieu of inferior goods or luxury goods.

The mathematical model form of the Engel function specification is exhibited in Table 2. The variables EXP_{ih} , Y_h , and MEALS are continuous, whereas all remaining variables are discrete. The base or omitted category for region is the South, the omitted category for population density is the suburban area, the omitted category for season is the summer (July-September 1977), and the omitted category for household size is more-than-two-person households. This study employs binary variables as intercept shifters, implying that they affect mean convenience and nonconvenience food expenditures. The estimated coefficients from such binary variables indicate the numerical amount by which the included classifications of discrete variables differs from the reference intercept. The use of interaction variables (slope shifters) may have merit in this analysis to reflect, for example, differences in the marginal propensity to spend on convenience and nonconvenience foods by race, household type, or geographic region. However, the introduction of slope-shifter variables leads to irreconcilable collinearity problems among the regressors.

If the meal planner is the female household head only, the female head and the male head, or the female head and someone else, then the female head is the household manager. If the meal planner is either the male household head only or the male head and someone else, then the male head is the household manager. If either the male household head or the female household head is at least 65 years of age, then the household type is elderly household.

Table 2. The Engel Function Specification

$$EXP_{ih} = f(\text{LOG } Y_h, \text{EDHM}, \text{EMPSHM}, \text{SXHM}, \text{R1}, \text{R2}, \text{R3}, \text{U1}, \text{U2}, \\ \text{S1}, \text{S2}, \text{S3}, \text{RAC}, \text{EH}, \text{SP}, \text{TP}, \text{MEALS})$$

where

EXP_{ih} = weekly expenditure on the i th convenience or nonconvenience food group for the h th household,

$\text{LOG } Y_h$ = weekly household income (in dollars),

EDHM = 1 if household manager not college educated; 0 otherwise,

EMPSHM = 1 if household manager unemployed; 0 otherwise,

SXHM = 1 if household manager female; 0 otherwise,

R1 = 1 if household located in the Northeast; 0 otherwise,

R2 = 1 if household located in the North Central; 0 otherwise,

R3 = 1 if household located in the West; 0 otherwise,

U1 = 1 if household located in central city; 0 otherwise,

U2 = 1 if household located in non-metropolitan area; 0 otherwise,

S1 = 1 if season spring (April-June, 1977); 0 otherwise,

S2 = 1 if season fall (October-December, 1977); 0 otherwise,

S3 = 1 if season winter (January-March, 1978); 0 otherwise,

RAC = 1 if household head black or other than white; 0 otherwise,

EH = 1 if elderly household; 0 otherwise,

SP = 1 if single-person household; 0 otherwise,

TP = 1 if two-person household; 0 otherwise, and

MEALS = number of meals eaten from the household food supply per week.

Aitchison and Brown (1954) provide evidence to indicate that increases in food expenditures are rapid as income rises, but saturation levels are approached at relatively low levels of income. The logarithm of weekly household income is introduced to account for this possible nonlinear form of the Engel function. The inclusion of MEALS accounts for the number of meals eaten at home in the Engel function.

Data and Procedures

Data for weekly time periods from the 1977-78 Nationwide Food Consumption Survey (NFCS) are utilized. The NFCS includes approximately 15,000 households located in the contiguous states. This analysis includes data from usable schedules for 9,673 households. Households excluded are those that did not report relevant demographic information. Additionally, only housekeeping households, defined as those households with at least one person having ten or more meals from the household supply during the survey period, are included in the analysis. Sample selection bias does not appear to be a problem because the frequencies for the usable sample are quite similar to the frequencies for the overall sample. The various food items in the NFCS, over 4,000 in all, are classified as either nonconvenience (35.3 percent) or convenience (64.7 percent).

Models are constructed to deal with not only aggregate convenience and nonconvenience groups but also with eight food groups delineated by nonconvenience/convenience classifications: (1) beverages, (2) fats and oils, (3) fruits, (4) grains, (5) meat and meat alternates, (6) milk equivalents, (7) sugars and sweets, and (8) vegetables.

Households not recording purchases during the specified period, but having otherwise complete records of socioeconomic characteristics, are included in the sample. The reasons for nonpurchases may be due to sufficient household inventory, response to market prices, or to general nonpreference of particular food groups. Sample observations with zero expenditure levels are retained to adequately portray the full range of observed behavior. Also, the deletion of all zero observations results in sample selection bias (Heckman (1979)), potentially leading to problems in empirical analysis. Tobit analysis (Tobin (1958)) is employed to account for the zero expenditure levels. The percentage of zero observations for the various food groups, with two exceptions, is less than 20 percent.

Under the assumption of normality of the disturbance terms, the method of estimation is maximum likelihood. The maximum likelihood estimation procedure assures the large-sample properties of consistency and asymptotic normality of the parameter estimates so that conventional tests of significance are applicable.

Descriptive statistics of the dependent and independent variables used in the analysis are exhibited in Tables 3-4. For all households, the average weekly weighted money value for convenience foods is \$20.69 and the average weekly weighted money value for nonconvenience foods is

Table 3. Descriptive Statistics of Dependent Variables

Dependent Variable	Mean	Standard Deviation	Percentage of Zero Expenditures
<u>Beverages</u>			
Convenience	3.11	4.67	16.86
<u>Fats and Oils</u>			
Convenience	0.58	0.64	17.91
Nonconvenience	0.82	0.87	13.86
<u>Fruits</u>			
Convenience	1.38	1.50	19.99
Nonconvenience	2.01	2.37	15.31
<u>Grains</u>			
Convenience	5.03	4.06	0.34
Nonconvenience	0.61	0.86	21.45
<u>Meat and Meat Alternates</u>			
Convenience	4.94	4.81	4.54
Nonconvenience	12.55	10.06	0.49
<u>Milk Equivalent</u>			
Convenience	1.82	2.17	15.70
Nonconvenience	3.90	3.37	2.69
<u>Sugars and Sweets</u>			
Convenience	0.63	1.39	41.15
Nonconvenience	0.58	0.77	13.80
<u>Vegetables</u>			
Convenience	2.29	2.10	7.54
Nonconvenience	3.20	2.95	3.06
<u>All Foods</u>			
Convenience	20.69	14.14	0.00
Nonconvenience	24.92	16.04	0.01

\$24.92. The principal food group in the nonconvenience category is unquestionably meat and meat alternates. Additionally, for the nonconvenience category, milk products, vegetables, and fruits, respectively, are notable food groups in terms of money value. Least in importance for the nonconvenience category are fats and oils, grains, and sugars and sweets. The principal food groups in the convenience category are grains and meat alternates. Next in importance in the convenience category are beverages, vegetables, milk products, and

Table 4. Descriptive Statistics of Independent Variables

Independent Variable	Mean	Standard Deviation
EDHM	0.7168	0.4505
EMPSHM	0.6007	0.4897
SXHM	0.9282	0.2580
Y	241.4660	146.7489
R1	0.2450	0.4301
R2	0.2436	0.4293
R3	0.1660	0.3721
U1	0.3044	0.4602
U2	0.3489	0.4766
S1	0.2357	0.4244
S2	0.2683	0.4431
S3	0.2623	0.4399
RAC	0.1518	0.3589
EH	0.2132	0.4096
SP	0.1785	0.3829
TP	0.2937	0.4554
MEALS	57.334	32.325

fruits. Finally, least in importance in terms of money value for the convenience category are sugars and sweets and fats and oils.

The average weekly income for all households in the sample is \$241.46, and the average number of meals eaten from the household food supply per week is roughly 57. Means of the binary vegetables reflect the proportions of households that fall into particular categories. For example, slightly more than 90 percent of the households in the sample have female household managers. Despite changing sex roles, women seemingly still make most of the food-related decisions and perform much of the food selection and preparation activities. In this sample, nearly 50 percent of all households are either single-person or two-person households, and roughly 20 percent of all households are elderly households.

Empirical Results

Estimates of regression coefficients and corresponding standard errors for all food groups delineated by nonconvenience/convenience classification are exhibited in Tables 5 and 6. With respect to convenience and nonconvenience foods, as expected there exists a direct relationship between the number of meals eaten from the household food supply and food expenditure per household. For convenience foods all income coefficients are not only positive but also statistically significant. The same is true for nonconvenience foods as well except for sugars and sweets and grains. For these two food groups in this category, the respective income coefficients are negative and statistically different from zero.

Table 5. Parameter Estimates^a and Associated Standard Errors in the Tobit Analysis for Convenience Foods

VARIABLE	BEVE	FATS	FRUI	GRAI	MEAT	MILK	SUGA	VEGE	ALL ^e
EDHM	-.7770E-01* (.2447E-01)	-.5122E-01* (.2449E-01)	-.2322* (.2452E-01)	.4172E-01 (.2398E-01)	.5043E-01* (.2407E-01)	-.1211* (.2440E-01)	-.1797E-01 (.2596E-01)	-.4514E-03 (.2414E-01)	-.2512 (.2543)
EMPSHM	-.3173E-01 (.2342E-01)	-.5542E-01* (.2342E-01)	.1278* (.2357E-01)	-.9155E-01* (.2297E-01)	-.7027E-01* (.2304E-01)	.5654E-02 (.2338E-01)	-.1348E-01 (.2484E-01)	.3403E-02 (.2311E-01)	-.6264* (.2434)
SXHM	-.3283* (.4484E-01)	.1085* (.4518E-01)	.6702E-01 (.4477E-01)	-.1033* (.4271E-01)	-.1640* (.4315E-01)	-.1672E-01 (.4451E-01)	.1823E-01 (.4923E-01)	-.8568E-02 (.4354E-01)	-2.6137* (.4525)
R1	.1775* (.2846E-01)	-.3220E-01 (.2846E-01)	.3650* (.2846E-01)	.3326* (.2784E-01)	.3727* (.2799E-01)	.1955* (.2829E-01)	.2059* (.3038E-01)	.1585* (.2798E-01)	4.6678* (.2941)
R2	.1052* (.2832E-01)	.3486E-01 (.2820E-01)	.9174E-01* (.2838E-01)	.1336* (.2756E-01)	.1711* (.2771E-01)	.1614E-01 (.2817E-01)	.2299* (.3009E-01)	.7246E-01* (.2780E-01)	1.8734* (.2921)
R3	.8288E-01* (.3230E-01)	.3017E-01 (.3213E-01)	.2011* (.3236E-01)	-.3960E-01 (.3140E-01)	-.9075E-01* (.3157E-01)	.4135E-01 (.3214E-01)	.1085* (.3464E-01)	-.3573E-01 (.3169E-01)	.9065* (.3329)
U1	.3815E-03 (.2737E-01)	-.2897E-01 (.2737E-01)	.8045E-01* (.2736E-01)	-.5700E-01* (.2668E-01)	.1007* (.2682E-01)	.2677E-01 (.2725E-01)	-.8170E-01* (.2910E-01)	.6516E-01* (.2688E-01)	.8371E-01 (.2829)
U2	.9369E-01* (.2589E-01)	.1387E-01 (.2574E-01)	-.2853E-01 (.2592E-01)	-.1229* (.2523E-01)	-.4361E-01 (.25343E-01)	-.6123E-01* (.2570E-01)	-.6306E-01* (.2737E-01)	-.1840* (.2547E-01)	-1.4364* (.2674)
S1	.8963E-03 (.3050E-01)	-.9915E-01* (.3048E-01)	.1023* (.3066E-01)	-.2647E-01 (.2973E-01)	.2615E-01 (.2991E-01)	-.5427E-01 (.3035E-01)	.1352* (.3284E-01)	.1056* (.3007E-01)	.3291 (.3152)
S2	-.1133* (.2966E-01)	-.1155* (.2954E-01)	.1989* (.2971E-01)	.2810E-01 (.2883E-01)	.5053E-01 (.2900E-01)	-.4587E-01 (.2947E-01)	.1733* (.3170E-01)	.1451* (.2916E-01)	.4068 (.3057)
S3	-.8384E-01 (.2980E-01)	-.8148E-01* (.2986E-01)	.1983* (.2986E-01)	.1353* (.2899E-01)	.8135E-01 (.2915E-01)	-.5000E-01 (.2962E-01)	.1868* (.3184E-01)	.2755* (.2932E-01)	1.3151* (.3073)
RAC	-.8148E-01* (.3261E-01)	-.3010* (.3284E-01)	.9623E-02 (.3255E-01)	-.2979* (.3164E-01)	-.1361* (.3184E-01)	-.2564* (.3266E-01)	-.2134* (.3537E-01)	-.7082E-01* (.3191E-01)	-2.8731* (.3346)
LOGINC	.1755* (.1826E-01)	.1398* (.1820E-01)	.1470* (.1829E-01)	.7310E-01* (.1770E-01)	.1606* (.1783E-01)	.8675E-01* (.1813E-01)	.9287E-01* (.1949E-01)	.9316E-01* (.1787E-01)	2.2365* (.1876)
MEALS	.6860E-02* (.4909E-03)	.8908E-02* (.4939E-03)	.7294E-02* (.4956E-01)	.2031E-01* (.5047E-03)	.1292E-01* (.4929E-03)	.1085E-01* (.4956E-03)	.6267E-02* (.5116E-03)	.1097E-01* (.4919E-03)	.2280* (.5122E-02)
EH	-.2739* (.3183E-01)	-.1230* (.3150E-01)	.4421E-01 (.3138E-01)	-.7296E-01* (.3033E-01)	-.1230* (.3063E-01)	-.8169E-01* (.3131E-01)	.2542E-01 (.3409E-01)	-.2491* (.3084E-01)	-1.9678* (.3215)
SP	-.1573* (.4651E-01)	-.2316* (.4636E-01)	-.1373* (.4641E-01)	-.2696* (.4501E-01)	-.1677* (.4528E-01)	-.1761* (.4623E-01)	-.2307* (.4998E-01)	-.3166* (.4551E-01)	-2.3208* (.4766)
TP	.3199E-02 (.3192E-01)	-.1342* (.3192E-01)	-.8889E-01* (.3210E-01)	-.2439* (.3133E-01)	-.9071E-01* (.3139E-01)	-.1268* (.3189E-01)	-.1516* (.3403E-01)	-.2075* (.3150E-01)	-1.6134* (.3317)
INTERCEPT	-.2267* (.1265)	-.3800* (.1263)	-.7029* (.1270)	.2501* (.1229)	-.4225* (.1235)	-.1310 (.1259)	-.9564* (.1351)	.5808E-01 (.1240)	-1.2060 (1.3030)
R ² ^b	.1079	.1677	.1302	.3960	.2346	.1756	.0703	.2331	.4386
F(2) ^c	.6913	.7707	.7612	.9432	.8655	.7624	.4916	.8711	NA
$\hat{\sigma}$	4.9899	.6851	1.6574	3.1760	4.3574	2.2304	1.9032	1.9525	NA
E[EXP] ^d	3.4799	.5991	1.4096	5.1022	5.1120	1.9036	.7394	2.3355	

*The parameter estimate is at least twice the associated standard error.

^aThe parameter estimates for normalized coefficients ($\hat{A} = \frac{\hat{B}}{\hat{\sigma}}$), where A corresponds to the normalized coefficients, \hat{B} corresponds to the regression coefficients, and $\hat{\sigma}$ corresponds to the standard error around the Tobit Index.

^bThe Theil Goodness-of-Fit Statistic.

^cThe predicted probability of EXP > 0 at the mean levels of the exogenous factors.

^dThe unconditional expected value of EXP at the mean levels of the exogenous factors.

^eThe OLS parameter estimates and associated standard errors.

Table 6. Parameter Estimates^a and Associated Standard Errors in the Tobit Analysis for Nonconvenience Foods

VARIABLE	FATS	FRUI	GRAI	MEAT	MILK	SUGA	VEGE	ALL
EDHM	.8386E-01* (.2440E-01)	-.1660* (.2438E-01)	-.3046E-01 (.2487E-01)	.1769* (.2403E-01)	-.7159E-01* (.2404E-01)	-.2698E-01 (.2452E-01)	-.6034E-01* (.2406E-01)	.9854E-01* (.2399E-01)
EMPSHM	.4322E-01 (.2333E-01)	-.3095E-02 (.2339E-01)	.6738E-01* (.2372E-01)	-.2897E-01 (.2296E-01)	-.4900E-01* (.2301E-01)	.8690E-02 (.2340E-01)	.3139E-01 (.2302E-01)	-.1499E-01 (.2295E-01)
SXHM	.7300E-01 (.4439E-01)	.2462* (.4477E-01)	.1153* (.4652E-01)	-.1383* (.4280E-01)	-.1155* (.4305E-01)	.2881E-01 (.4488E-01)	.2624* (.4347E-01)	-.5643E-01 (.4266E-01)
R1	.2146* (.2819E-01)	.2412* (.2835E-01)	.3901* (.2886E-01)	.7831E-01* (.2775E-01)	.2805* (.2787E-01)	-.2241* (.2838E-01)	-.3399E-01 (.2783E-01)	.15393* (.2775E-01)
R2	.3496E-01 (.2807E-01)	.1216* (.2818E-01)	.1524* (.2861E-01)	-.1726* (.2758E-01)	.1259* (.2765E-01)	-.1252* (.2808E-01)	-.9538E-01* (.2765E-01)	-.1120* (.2755E-01)
R3	-.2476E-01 (.3200E-01)	.3824* (.3202E-01)	.1874* (.3264E-01)	-.1775* (.3143E-01)	.2532* (.3152E-01)	-.9303E-01* (.3210E-01)	-.1377* (.3152E-01)	-.5224E-01 (.3139E-01)
U1	.7685E-01* (.2717E-01)	.1152E-01* (.2717E-01)	.1580* (.27703-01)	.8869E-01* (.2669E-01)	-.4181E-01 (.2674E-01)	-.6577E-01* (.2675E-01)	.3307E-01 (.2677E-01)	.7194E-01* (.2667E-01)
U2	.4674E-01 (.2564E-01)	-.4079E-01 (.2573E-01)	.3542E-01 (.2614E-01)	-.1013* (.2523E-01)	-.3798E-01 (.2527E-01)	.2352* (.2572E-01)	.1211* (.2530E-01)	-.4322E-01 (.2521E-01)
S1	-.1424* (.3039E-01)	-.2574* (.3037E-01)	-.3467E-01 (.3102E-01)	.4259E-01 (.2975E-01)	-.5720E-01 (.2983E-01)	-.1031* (.3045E-01)	-.3290* (.2991E-01)	-.1112* (.2973E-01)
S2	.3713E-01 (.2931E-01)	-.3334* (.2946E-01)	.1324* (.2990E-01)	.9338E-01* (.2885E-01)	.4602E-01 (.2891E-01)	-.5791E-02 (.2940E-01)	-.3794* (.2903E-01)	-.6629E-01* (.2882E-01)
S3	.3832E-01 (.2946E-01)	-.3351* (.2964E-01)	.1385* (.3006E-01)	.8030E-01* (.2899E-01)	.6076E-01* (.2906E-01)	-.5640E-01 (.2957E-01)	-.4910* (.2928E-01)	-.9169E-01* (.2897E-01)
RAC	.1609* (.3212E-01)	-.4059E-01 (.3247E-01)	.4090* (.3250E-01)	.4699* (.3173E-01)	-.4052* (.3187E-01)	-.9576E-01* (.3225E-01)	-.1201* (.3172E-01)	.1873* (.3157E-01)
LOGINC	.5055E-01* (.1806E-01)	.1391* (.1820E-01)	-.5144E-01* (.1845E-01)	.1803* (.1775E-01)	.7248E-01* (.1776E-01)	-.4964E-01* (.1813E-01)	.1342* (.1871E-01)	.2092* (.1775E-01)
MEALS	.1054E-01* (.4940E-03)	.8990E-02* (.4949E-03)	.1199E-01* (.4991E-03)	.1779E-01* (.4997E-03)	.2074E-01* (.5065E-03)	.1023E-01* (.4947E-03)	.1260E-01* (.4922E-03)	.2424E-01* (.5134E-03)
EH	.3777E-01 (.3101E-01)	.1436* (.3112E-01)	-.1392E-01 (.3178E-01)	-.4362E-01 (.3034E-01)	-.2281E-01 (.3047E-01)	.5578E-01 (.3122E-01)	.1173* (.3048E-01)	.1056E-01 (.3031E-01)
SP	-.2625* (.4605E-01)	-.2934E-02 (.4612E-01)	-.2907* (.4722E-01)	-.1217* (.4498E-01)	-.1036* (.4513E-01)	-.2892* (.4638E-01)	.5110E-01 (.4517E-01)	-.1124* (.4494E-01)
TP	-.18373E-01 (.3173E-01)	.7027E-01* (.3190E-01)	-.2558E-01 (.3225E-01)	.8311E-01* (.3129E-01)	-.1249* (.3135E-01)	-.9697E-01* (.3181E-01)	.2252* (.3140E-01)	.9811E-01* (.3128E-01)
INTERCEPT	-.2462 (.1254)	-.5953* (.1264)	-.3172* (.1282)	-.5000* (.1230)	.1240E-01 (.1233)	.3695* (.1258)	-.2710* (.1236)	-.4249* (.1228)
R ² ^b	.1632	.1306	.1964	.3244	.3628	.1743	.1745	.4272
F(2) ^c	.7998	.7602	.6963	.9343	.9197	.7418	.8744	.9800
$\hat{\sigma}$.8953	2.4958	.9206	8.3055	2.7520	.7811	2.7441	12.141
E[EXP] ^d	.8530	2.1165	.6511	12.7700	3.9617	.6285	3.3205	25.0177

*The parameter estimate is at least twice the associated standard error.

^aThe parameter estimates for normalized coefficients ($\hat{A} = \frac{\hat{B}}{\hat{\sigma}}$), where A corresponds to the normalized coefficients, \hat{B} corresponds to the regression coefficients, and $\hat{\sigma}$ corresponds to the standard error around the Tobit Index.

^bThe Theil Goodness-of-Fit Statistic.

^cThe predicted probability of EXP > 0 at the mean levels of the exogenous factors.

^dThe unconditional expected value of EXP at the mean levels of the exogenous factors.

Income elasticities at mean food expenditure levels for the various groups of nonconvenience and convenience foods are exhibited in Table 7. The relatively low-income elasticities, ranging from 0.0429 to 0.1740 for convenience foods and ranging from -0.0506 to 0.1247 for nonconvenience foods; are evidence that convenience and nonconvenience food expenditures for at-home use are not going to be substantially affected by income changes. With two exceptions, all commodities are normal goods. The income elasticity for convenience foods, except for vegetables, exceeds the income elasticity for nonconvenience foods.

Households with college-educated household managers spend significantly more on beverages, fruits, and milk products labeled as convenience products and milk, fruits, and vegetables labeled as nonconvenience products than do households without college-educated household managers. Households with college-educated household managers spend significantly less on total nonconvenience foods, meat and meat alternates classified as nonconvenience products, and fats and oils in general than do households without college-educated household managers.

Households with unemployed household managers expend significantly less on total convenience foods, fats and oils, grains, and meat and meat alternates labeled as convenience products, and milk labeled as nonconvenience products than do households with employed household managers. Households with unemployed household managers expend significantly more on fruits labeled as convenience products and grains labeled as nonconvenience products than do households with employed household managers.

Table 7. Income Elasticities for the Respective Food Groups by Nonconvenience/Convenience Classification

	Nonconvenience	Convenience
Beverages	NA	0.1740
Fats and Oils	0.0424	0.1232
Fruits	0.1247	0.1316
Grains	-0.0506	0.0429
Meat and Meat Alternates	0.1095	0.1185
Milk	0.0463	0.0774
Sugars and Sweets	-0.0457	0.1175
Vegetables	0.0969	0.0678
All Foods	0.0995	0.1080

Households with female household managers pay out substantially less per week for total convenience foods, beverages, grains, and meat and meat alternates classified as convenience products, and meat and meat alternates and milk classified as nonconvenience products, than do households with male household managers. Households with female household managers disburse more per week for grains, fruits and vegetables classified as nonconvenience products and fats and oils labeled as convenience products than do households with male household managers.

Households located in the Northeast, the North Central, and the West generally spend significantly more on total convenience foods, beverages, fruits, meat and meat alternates, and sugars and sweets classified as convenience products and more on fruits, grains, and milk products in the nonconvenience category than do households located in the South. Households located in the South spend substantially more on meat and meat alternates, sugars and sweets, and vegetables labeled as nonconvenience products than do households located in the North Central and in the West. With few exceptions, households located in the Northeast expend significantly more on all food groups than do households located in the South.

Households located in central cities spend significantly more on fruits, meat and meat alternates, and vegetables classified as convenience products, total nonconvenience foods, fats and oils, grains, and meat and meat alternates classified as nonconvenience products than do suburban households. Households located in suburban areas spend substantially more on sugars and sweets than do households located in central cities. Generally, households located in non-metropolitan areas expend significantly less on all convenience food groups than do households located in suburban areas. However, households located in non-metropolitan areas expend significantly more on sugars and sweets and vegetables labeled as nonconvenience products than do suburban households.

Seasonal purchase patterns for nonconvenience and convenience foods are evident. On average, households disburse more for fruits, sugars and sweets, and vegetables as convenience products and less for these food groups as nonconvenience products in the spring, fall, and winter than in the summer. Households expend more on fats and oils as convenience products and on total nonconvenience foods in the summer than in other seasons. Households spend more on grains and meat and meat alternates in the winter than in the summer.

In general, non-white households, elderly households, single-person households, and two-person households expend significantly less per week on all convenience food groups than do white households, nonelderly households, and more-than-two-person households. Non-white households spend more on total nonconvenience foods, fats and oils, grains, and meat and meat alternates labeled as nonconvenience products and less on milk, sugars and sweets, and vegetables labeled as nonconvenience products than do white households. Elderly households expend significantly more on fruits and vegetables as nonconvenience products

than do nonelderly households. Finally, two-person households spend substantially more on total nonconvenience foods, fruits, meat and meat alternates, and vegetables as nonconvenience products than do more-than-two-person households.

The results of this research point to the long-run changes in food demand that result from changes in income levels, household characteristics, and population movements. Food industry analysts can use this information in planning marketing program strategies. Also, results from this analysis can be combined with projections for the relevant explanatory variables to identify trends for convenience and nonconvenience food expenditures in the United States in coming years.

Projections

This section deals with the projection of nominal weekly food expenditures for convenience and nonconvenience foods for the period 1980 to 2000. This projection depends on the previously discussed empirical results as well as particular values of the independent variables in the expenditure functions. The respective values of the independent variables for the year 1980 come from the Statistical Abstract of the United States, while the respective values for the year 2000 come primarily from projections through the use of linear extrapolation (see Table 8). The definitive description of the respective linear extrapolations is available from the authors upon request.

On the basis of Table 8, the number of households wherein the household manager possesses a college education is expected to rise by almost 9 percent from 1980 to 2000, and the number of households wherein the household manager is employed is expected to rise by more than 12 percent. The number of households located in the Northeast and the North Central is projected to decline by 2.7 percent and 2.3 percent respectively, from 1980 to 2000, while the number of households located in the West is projected to increase by 3.6 percent. Further, the number of households located in central cities is expected to fall by almost 6 percent, and the number of households located in non-metropolitan areas is expected to rise by almost 2 percent from 1980 to 2000. The number of non-white households, elderly households, single-person households, and two-person households is projected to increase by 2.1 percent, 1.8 percent, 8.0 percent, and 1.7 percent respectively. Finally, the nominal weekly household income from 1980 to 2000 is expected to almost double.

Using the information in Tables 5, 6, and 8, we calculated percentage changes of weekly nominal food expenditures for convenience and nonconvenience foods for the period 1980 to 2000 (Table 9). In the aggregate, nominal convenience food expenditures are expected to increase by 4.9 percent, and nominal nonconvenience food expenditures are expected to increase by 5.4 percent. However, for the various food groups, except for fruits and vegetables, the percentage changes of

Table 8. Values of the Independent Variables for the Year 1980 and the Year 2000

Independent Variable	Year	
	1980	2000
EDHM	.830 ^a	.741 ^b
EMPSHM	.466 ^a	.340 ^b
SXHM	.928	.928
R1	.217 ^a	.190 ^b
R2	.260 ^a	.237 ^b
R3	.191 ^a	.227 ^b
U1	.300 ^a	.242 ^b
U2	.252 ^a	.269 ^b
S1	.250	.250
S2	.250	.250
S3	.250	.250
RAC	.138 ^a	.159 ^c
Y	340.57 ^a	657.76
MEALS	57.334	57.334
EH	.113 ^a	.131 ^d
SP	.226 ^a	.306 ^b
TP	.314 ^a	.331 ^b

^aStatistical Abstract of the United States, 1982-83

^bProjections from Linear Extrapolation

^cProjections of the Population of the United States: 1977 to 2050.

^dDemographic and Socioeconomic Aspects of Aging in the United States.

Table 9. Percentage Change of Weekly Nominal Food Expenditures for Convenience and Nonconvenience Foods From 1980 to 2000.

	<u>Convenience</u>	Percent	<u>Nonconvenience</u>
Beverages	16.1		NA
Fats and Oils	8.0		-0.9
Fruits	10.9		14.5
Grains	0.6		-16.0
Meat and Meat Alternates	6.0		5.9
Milk	5.3		2.8
Sugars and Sweets	161.3		-7.6
Vegetables	1.0		7.9
All Foods	4.9		5.4

nominal food expenditures are greater for convenience foods than for nonconvenience foods. With regard to expenditures on particular convenience food groups, increases in excess of 10 percent occur for sugars and sweets, beverages, and fruits, while increases of at most 1 percent occur for vegetables and grains. With regard to expenditures on particular nonconvenience food groups, increases in excess of 10 percent occur only for fruits. Increases between 5 and 10 percent occur for vegetables and meat and meat alternates, while declines occur for fats and oils, grains, and sugar and sweets.

REFERENCES

- Aitchison, J. and J.A.C. Brown, "A Synthesis of Engel Curve Theory," Review of Economic Studies, 22(1954):35-46.
- Bureau of Labor Statistics, 1980 Handbook of Labor Statistics, Bulletin 2070, p. 17.
- Gronau, Reuben, "Leisure, Home Production, and Work - The Theory of the Allocation of Time Revisited," Journal of Political Economy, 85(1977):1099-1123.
- Harp, Harry H. and Denis F. Dunham, "Comparative Cost to Consumers of Convenience Foods and Home Prepared Foods," Marketing Research Report No. 609, United States Department of Agriculture, Economic Research Service, Marketing Economics Division, 1963, Washington, D.C.
- Havlicek, Joseph, Jr., Julein M. Axelson, Oral Capps, Jr., Joanne M. Pearson, and Suzanne Richardson, "Nutritional and Economic Aspects of Convenience and Nonconvenience Foods," Proceedings of the 1983 Agricultural Outlook Conference, January 1982, 539-550, Government Printing Office, Washington, D.C.
- Heckman, James J., "Sample Selection Bias as a Specification Error," Econometrica, 47(1979):153-161.
- Livingston, G. E. and C. M. Chang, "Commercial Production of Ready-to-Serve Food in the United States," K. Paulus, ed., How Ready Are Ready-to-Serve Foods?, 1978, 35-48, S. Karger, Basel.
- Michael, Robert, "The Effect of Education on Efficiency in Consumption," National Bureau of Economic Research, Occasional Paper 116, 1972.
- Price, David W., "Effects of Socioeconomic Variables and Food Stamp Participation on the Consumption of Selected Food Groups," Agricultural Research Center, Washington State University, Pullman, Washington, Research Bulletin XB0932, 1983.
- Prochaska, Fred and R. A. Schrimper, "Opportunity Cost of Time and Other Socioeconomic Effects on Away-From-Home Food Consumption," American Journal of Agricultural Economics 55(1973):595-603.
- Redman, Barbara J., "The Impact of Women's Time Allocation on Expenditure for Meals Away from Home and Prepared Foods," American Journal of Agricultural Economics 62(1980):234-237.
- Siegel, J.S. and M. Davidson, Demographic and Socioeconomic Aspects of Aging in the United States, Current Population Reports, Special Studies, Series P23, No. 138, 1984, United States Department of Commerce.

Stafford, T. H. and J. W. Wills, "Consumer Demand Increasing for Convenience in Food Products," National Food Review (Winter 1979):15-17.

Statistical Abstract of the United States, 1982-83, United States Department of Commerce, Government Printing Office, Washington, D.C.

Tobin, J., "Estimation of Relationships for Limited Dependent Variables," Econometrica 26(1958):24-36.

Traub, Lawrence G. and Diane Odland, "Convenience Foods vs. Home-Prepared Foods: Comparative Costs, Yield, and Quality," Agricultural Economics Report 429, 1979, United States Department of Agriculture, Washington, D.C.

United States Department of Commerce, Bureau of the Census, Projections of the Population of the United States: 1977 to 2050, Current Population Reports, Series P-25, No. 704, Government Printing Office, Washington, D.C.