The Impact of Demographics, Market Characteristics and Prices on the Consumption of Food-Away from Home

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Introduction:

One of the largest recent changes in consumer food purchasing is the trend towards greater consumption of food eaten outside the home. Between 1960 and 1994, the share of total food expenditures spent on food away from home (FAFH) went from 27 to 47 percent (Manchester and Clauson). For the five years from 1987 to 1992, sales of all types of FAFH increased 32.2 percent, while the number of eating establishments increased 14 percent (U.S. Census of Retail Trade). Factors such as rising family incomes and increasing female labor participation have contributed to this trend.

Many studies have examined the role of demographics and/or prices in this growth, using both aggregate time series and consumer level survey data, usually treating all FAFH as a single category. This study also examines the factors affecting FAFH consumption, but we use cross-sectional, state level data, and segment the FAFH market by type of facility and primary menu item. One objective of this research is to focus attention on the different subsectors of the FAFH market, and another is to emphasize the important role that convenience and access costs play in the demand for FAFH.

The demand for convenience is often found to be a driving force behind increased consumption of FAFH typically via variables like female labor participation rate and opportunity cost of time (e.g. Kinsey, Redman, Lee and Brown, among others). The relative ease with which a consumer can acquire a meal outside the home (i.e.- the supply of convenience) has seldom been considered, because it is difficult to do so with the usual data.

The importance of the ease of acquiring a meal has not been overlooked by the fast-food industry. In a recent *Forbes* magazine (1996) article, executives from McDonald's noted that the number of per-capita transactions at McDonald's varies proportionately with penetration in a market. In other words, the more stores McDonald's puts in a city, the more often people go (p.47). This gives strong support to our belief that access costs play a key role in the growing consumption of FAFH, and in fast food consumption in particular.

There are actually two components of the cost the consumer of FAFH incurs: the actual price for the meal itself, and the search and access expenses of acquiring that meal. An analysis of FAFH may be incomplete without accounting for both of these, or ensuring they are constant. The growth is likely due to both an outward shift in demand from changing income and tastes, and a movement down the demand curve due to increasing availability (outward shift in supply) of FAFH. Previous attention has focused on the first of these two forces. We account for the supply change directly by incorporating the relative availability of the different types of FAFH: units per person of fast food establishments, and expensive, mid-priced, and inexpensive restaurants[1]. Clearly, the more densely concentrated are restaurants in a market,

[1] Binkley and Eales (1995) incorporated measures of availability in their analysis using 1987 metro-level data, and found them to be important. They also tested for, and rejected, endogeneity.

the closer is the average consumer to them. Thus, the lower is consumer access cost. The space the trade press devotes to market "saturation" is further evidence of the importance of these measures.

Model Specification and Estimation:

We perform two analyses, one focusing on the effect of demographic and market characteristic variables on per capita FAFH expenditures, the other focusing on the role of prices. In each case we segment FAFH by type of facility. To maintain consistency with economic theory, the role of prices is examined via an AIDS model of food consumption.

In the first analysis we segment per capita FAFH consumption into six categories: fast food hamburger, pizza and chicken; and expensive, mid-priced, and inexpensive table service restaurants. Each is regressed on a set of demographic, socio-economic, and market characteristic variables. We also perform an analysis with all fast food as a single category. All dependent variables are from the 1992 Census of Retail Trade, Miscellaneous Subjects Series. This segments FAFH in several ways, including by price, which allowed us to segment table service restaurants into three price categories: inexpensive (having an average check size of 5 dollars or less); mid-priced (check size between 5 and 10 dollars); and expensive (check size exceeding 10 dollars). All sales are per capita, based on the 1992 state population.

Demographic, socio-economic, and market characteristic variables include the following:

1.) The female labor participation rate for 1992 (F92). This variable is often found to be a significant (positive) determinant of FAFH consumption.

2.) The percent of total households in each state that are "families" (FAMPCT). It is calculated as the total number of family households in each state, divided by that state's population. This has not been included in previous analyses. We would expect families to consume fewer meals from expensive restaurants, and likely either more meals at home or at relatively inexpensive FAFH outlets.

3.) The percent of persons in each state that have at least a four year college degree (COLG). Similar variables are often included in panel data studies, though the results often vary with the study. We have no strong prior beliefs on the effect of college education.

4.) Three age categories are included in each regression; the percent of people aged 18 to 24 years (YR18-24), 25 to 44 (YR25-44), and 65 and over (YR65). Age has also been included in previous studies, and again different studies often give different results.

5.) We include median family income (in $1,000's) by state (INC), as well as the percent of households with income less than $15,000 (INC15), and the percent of households with income greater than $75,000 (INC75). We expect income to have a positive effect on consumption of FAFH, but likely a stronger effect on expensive restaurant consumption than on less expensive restaurant and fast food consumption. Most previous studies find income effects to be inelastic. Including the upper and lower income ranges in the analysis along with median income has not been done previously, so we are uncertain how the results will be affected. This should allow us to investigate how income distribution affects consumption patterns. One expectation is that people in the upper income bracket will consume more meals from expensive restaurants and relatively fewer inexpensive restaurant and fast food meals.

6.) Dummy variables are included for four regions of the U.S., the Midwest (MW), the South (SO), the West (WE), and the Northeast (NE). Northeast is dropped to avoid singularity. These are meant to capture effects unexplained by the other variables, so their estimated coefficients are not always meaningful.

7.) Finally, we include four measures of the ease with which fast food, and the three categories of restaurant food, can be obtained by the consumer: the number of outlets of each type is divided by state population. We expect that as the "density" of a particular type increases, the cost, or effective price, to the average consumer is decreased, so own quantity increases and substitution quantity decreases.

In the second analysis we estimate an Almost Ideal Demand (AIDS) System of food consumption by type of FAFH, but to simplify interpretation we do not disaggregate the hamburger, chicken, and pizza components from total fast food. From the AIDS estimates we calculate own, cross-price, and income elasticities for each type of FAFH.

We estimate the linear version of the AIDS model using Stones price index. This is a common simplification. We also impose the classic restrictions implied by theory; adding-up, homogeneity, symmetry. The system is estimated using the iterated seemingly unrelated regression estimator, omitting the inexpensive restaurant share equation to impose the adding-up condition. Refer to Deaton and Muellbauer (1980) for a complete discussion of the AIDS model and the implications of the restrictions. Standard errors were calculated for the elasticity estimates as in Chalfant (1987), by assuming that the budget shares are exogenous. Hence, they are only approximations.

We include in the system all of the variables from the first analysis, except for the income variables, inclusion of which would violate the expenditure separability assumption implied by the model. Prices for each food consumption category are also included.

Prices for the three categories of restaurant food were calculated as averages weighted by sales within each of the price categories reported by the Census of Retail Trade. An aggregate fast food price was calculated in a similar manner, based on sales weighted averages of the seven price categories for fast food.

A measure of FAH price was obtained from the American Chamber of Commerce Research Association (ACCRA). ACCRA publishes cost of living data and indices for U.S. urban areas, one of which is a grocery price index. We used this as a measure of relative prices for food at home. We take the simple average over all metropolitan areas in each state to get the average for that state.

Results:

The results of the first analysis are presented in table 1, while the AIDS elasticities and their standard errors are presented in table 2. The first analysis reveals that the results for BURGER tend to closely mirror those of the aggregate fast food category. This illustrates the importance of hamburger outlets within the fast food industry, accounting for nearly half of total sales. Results for the pizza and chicken categories, though not as strong, still reveal interesting relationships. For example, we believe college towns to have higher than average consumption of fast food, but it appears that any significant positive relationship between college education and fast food consumption is limited to the pizza category. The proliferation of pizza outlets around college towns likely plays a key role here. It is interesting that after

taking account of college education, consumers who are of college age (YR18-24) actually consume less pizza than average. This is further evidence that easy access to this type of food around college campuses likely increases consumption. Other than the income variables (which will be discussed below) the only significant variable in the chicken equation is the dummy

Table 1.OLS Results Illustrating the Impact of Various Determinants of Per-Capita Food-Away-From-Home Consumption[1].

	BURGER	PIZZA	CHICKEN	EXPR	MIDR	CHPR	FF
Intercept	-0.584 (-2.77)**	-0.101 (-0.70)	0.025 (0.16)	0.317 (0.57)	-0.702 (-2.72)**	0.154 (0.72)	-0.933 (-2.45)**
F92	0.002 (2.61)**	-0.001 (-0.79)	0.001 (1.41)	-0.001 (-0.53)	-0.002 (-1.89)*	-0.0008 (-0.95)	0.002 (1.318)
FAMPCT	0.356 (3.30)**	-0.034 (-0.46)	0.078 (0.99)	-0.250 (-0.89)	0.359 (2.72)**	-0.023 (-0.21)	0.749 (3.84)**
FFDEN	146.157 (4.70)**	82.656 (3.81)**	22.535 (0.97)	207.179 (2.49)**	54.155 (1.40)	13.081 (0.41)	569.427 (10.00)**
EXRDEN	-42.136 (-1.16)	37.384 (1.50)	-35.378 (-1.32)	582.196 (6.07)**	18.996 (0.43)	-23.638 (-0.64)	107.791 (1.65)*
CHPDEN	-140.626 (-4.45)**	-23.509 (-1.08)	-35.587 (-1.528)	-124.284 (-1.49)	-32.469 (-0.84)	233.148 (7.26)**	-234.585 (-4.11)**
MIDDEN	-60.821 (-1.55)	-80.769 (-2.99)**	33.478 (1.16)	165.658 (-1.60)	196.886 (4.10)**	42.503 (1.07)	-45.593 (-0.64)
COLG	-0.002 (-2.06)**	0.001 (2.12)**	-0.0003 (1.27)	-0.001 (-0.45)	0.003 (2.39)**	0.001 (1.13)	-0.003 (-1.71)*
YR65	0.007 (3.45)**	-0.0003 (-0.22)	0.0009 (0.59)	0.009 (1.55)	0.009 (3.40)**	0.0000 (0.02)	0.011 (2.87)**
YR25-44	0.011 (4.27)**	0.001 (0.67)	0.0006 (0.35)	-0.001 (-0.16)	0.015 (4.54)**	-0.0002 (-0.08)	0.013 (2.74)**
YR18-24	0.009 (2.65)**	-0.005 (-2.14)**	0.003 (1.27)	0.029 (3.10)**	0.010 (2.25)**	-0.003 (-0.89)	0.022 (3.41)**
INC	-0.005 (-2.25)**	0.004 (2.70)**	-0.005 (-2.79)**	-0.017 (-2.48)**	-0.001 (-0.40)	-0.0002 (-0.09)	-0.014 (-2.94)**
INC15	-0.002 (-1.81)*	0.002 (1.78)*	-0.002 (-1.82)*	-0.008 (-2.20)**	-0.003 (-2.03)**	-0.002 (-1.48)	-0.005 (-2.38)**
INC75	0.003 (1.02)	-0.006 (-3.44)**	0.005 (2.74)**	0.023 (3.18)**	-0.004 (-1.37)	-0.002 (-0.63)	0.012 (2.60)**
MW	0.026 (3.07)**	0.005 (0.90)	0.004 (0.69)	0.063 (2.83)**	0.039 (3.74)**	0.003 (0.33)	0.084 (5.48)**
SO	0.012 (1.23)	0.001 (0.16)	0.016 (2.12)**	0.043 (1.58)	0.025 (1.97)*	0.012 (1.12)	0.054 (2.92)**
WE	0.024 (2.58)**	0.009 (1.40)	-0.006 (-0.91)	0.039 (1.62)	0.037 (3.28)**	0.009 (1.03)	0.060 (3.65)**
R^2	0.76	0.55	0.73	0.93	0.88	0.87	0.91

1. BURGER=Fast food hamburger, PIZZA=Fast food pizza, CHICKEN=Fast food chicken, EXPR=Expensive restaurant, MIDPR=Mid-priced restaurant, CHPR=Inexpensive restaurant, FF=Aggregate fast food.

** Denotes significance at the 5 percent level. t-values in parentheses.

* Denotes significance at the 10 percent level.

variable for the south (SO), which illustrates strong regional preferences. The relatively minor proportion of FAFH sales accounted for by fast food chicken outlets makes inference within this category more difficult.

We find a strong, positive association between the percent of families in the population and hamburger consumption. This illustrates the success that fast food hamburger outlets have had at marketing to families, especially those with kids. It is likely that McDonald's "playgrounds" play an important role here. This result carries over to the aggregate fast food equation, though it is possible that hamburger outlets are driving it. Family percentage appears to have no effect on consumption from expensive restaurants, though it is a positive and significant determinant of consumption from mid-priced restaurants. The high cost associated with dining at expensive restaurants, and the fact that expensive restaurants tend not to be marketed towards families, would lead us to expect zero or even a negative relation between family percentage and expensive restaurant consumption. It appears that families tend to choose predominantly mid-priced restaurants when consuming table service FAFH. The significance of the age categories in many of the regressions reveals that different age groups do have different preferences for FAFH. College education has a significant (negative) effect on hamburger consumption, and a significant (positive) effect on mid-priced restaurant and pizza consumption.

The results for the median income variables are disturbing. Most of them are negative, including fast food hamburger, chicken, aggregate fast food, and expensive restaurants, which are significant. Only fast food pizza had the expected positive, significant sign. The unusual behavior of income carries over to some degree to the AIDS elasticities we discuss below. This will be a subject of further research. The signs on the income distribution variables do show that, in

general, as the income distribution becomes skewed towards the upper brackets (higher percentage of consumers in the upper income bracket), consumption of most types of FAFH increases, and the opposite tends to hold for the lower income bracket, which was negative in most of the equations and often significant. This is a result we might expect.

The most important variables, in terms of magnitudes of the parameter estimates and significance, for all the categories of FAFH were the various outlet density variables. In every case, there was a positive and significant relationship between the number of FAFH outlets of a particular type per person, and per capita consumption from that type of outlet. This illustrates the fact that as availability of a given type of FAFH increases, people will be apt to consume more of that type. This result implies that an increase in the number of a particular type of establishment decreases the search costs associated with consuming that good, thereby lowering the actual cost paid by the consumer. The coefficient itself can be roughly interpreted as the expected increase (or decrease) in sales for the average state, in thousands of dollars, that would result from the introduction of one more unit of that type. In absolute magnitude, the EXRDEN variable in the equation for expensive restaurants is largest, although since these meals are also the most expensive, it is safe to conclude that in terms of quantity consumed, the FFDEN variable in the fast food equation represents the largest change in quantity demanded resulting from the addition of another unit.

The significant negative relationships between the density of inexpensive restaurants and fast food consumption illustrates that inexpensive restaurants could be viable substitutes for fast food. This basic result carries through to the fast food hamburger equation. However, in the equation for inexpensive restaurants the fast food density variable is not significant, which shows

that fast food is not necessarily a viable substitute for inexpensive table service meals. From this we draw the conclusion that fast food outlets are likely not infringing on the business of the small, "Mom and Pop" restaurants that are common in this category. Similar results were found by Binkley and Eales (1995) using 1987 metro-area data. The implied result that an increase in fast food establishments per capita is associated with an increase in consumption of meals from expensive restaurants and vise-versa (i.e.- that they are complements), eludes an obvious interpretation.

Among all the categories of FAFH, the mid-priced restaurant and aggregate fast food categories have the strongest results. The mid-priced restaurant category represents only 22.6 percent of expenditures on FAFH in 1992, compared to about 47 percent for fast food (the largest FAFH segment) but it represents 42 percent of the expenditures on table service meals. Casual observation would also suggest that the mid-priced restaurant category is one of the fastest growing. The rapid growth in national and regional chains in this category (e.g. Applebees's, The Olive Garden, etc.) would lead us to expect that more recent data would reveal that mid-priced restaurants today have an even greater share of the FAFH market. The rapid changes and state of flux of this segment could be partially responsible for the unusual behavior of the income variable that was discussed earlier.

Turning to a discussion of the effects that prices have on consumption, we examine Table 2. To conserve space, we report only the price and income elasticities, along with their standard errors. However, we did include in the model all of the demographic and

Table 2.Estimated Own and Cross-Price Elasticities From AIDS Model For Six Categories of Food Consumption[1].

	Fast Food	Exp. Rest.	Midpr. Rest.	Inexp. Rest.	Grocery	Income
Fast Food	-0.929*	-0.086	0.868*	0.026	-0.244	0.364*
	(0.061)	(0.067)	(0.081)	(0.086)	(0.151)	(0.132)
Exp. Rest.	0.153	-0.738*	2.266*	-0.828*	-1.000*	0.146
	(0.166)	(0.183)	(0.221)	(0.234)	(0.413)	(0.844)
Midpr. Rest.	0.072	0.237	-2.660*	1.662*	0.333	0.355*
	(0.127)	(0.141)	(0.169)	(0.180)	(0.317)	(0.171)
Inexp. Rest.	0.166	0.118	1.974*	-3.867*	1.076	0.533*
	(0.231)	(0.256)	(0.308)	(0.326)	(0.576)	(0.257)
Grocery	-0.050*	-0.038*	-0.349*	0.058*	-0.959*	1.338*
	(0.015)	(0.016)	(0.020)	(0.021)	(0.087)	(0.051)

1. Standard Errors are in parentheses.
* Indicates significance at the 5 percent level.

market characteristic variables (through demographic translating) from the first analysis. These variables tended to be similar in sign and significance to the above results. We also keep fast food as a single category, which making interpretation of results easier, presumably little cost.

Table 2 reports the own price, cross price, and income elasticities, calculated at the mean, for the five categories of food consumption. The rather high price elasticities of demand for both mid-priced and inexpensive restaurants (-2.66 and -3.87, respectively) indicate that there are viable substitutes for both, and the high, positive cross-price elasticities between these two categories indicates that consumers substitute across these two types of outlets. The cross price elasticities between expenditures at grocery stores and inexpensive restaurants indicate that these items are reasonably good substitutes as well.

Expensive restaurants have the lowest (most inelastic) own price elasticity, indicating fewer viable substitutes, but the cross price elasticities indicate that consumers do substitute

somewhat between expensive and mid-priced restaurants. Fast food and grocery (FAH) outlets have nearly identical, just slightly inelastic own price elasticities.

The income elasticities indicate that FAH is the most income elastic food choice, while expensive restaurant meals are the most income inelastic (though the expensive restaurant elasticity is not significant). While many previous studies have found aggregate FAFH to be income inelastic (e.g. Lamm, Prochaska and Schrimper, Hiemstra and Eklund), most find it not as inelastic as our estimates. Furthermore, most studies that disaggregate FAFH by type of facility usually find restaurant meals to be much more income elastic than fast food meals (e.g. Brown, McCracken and Brandt). Our results reveal that fast food and mid-priced restaurants have similar, rather inelastic income elasticities, while inexpensive table service restaurants are the most income elastic of all FAFH choice.

Conclusions:

The impact of demographic and market characteristic variables on the demand for several different types of FAFH was examined. We disaggregated FAFH into several categories based on type of facility, menu choice, and check size. Our results indicate the importance of distinguishing between FAFH expenditures at different types of eating places.

We found that outlet density is an important determinant of consumption of most types of FAFH. This we can attribute to an increase in the supply of convenience to the consumer, which lowers the cost of acquiring the product i.e.- the access cost. We also found that fast food consumption is largely driven by the fast food hamburger market, to which families are important consumers.

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Abstract

State data is used to determine the impact of price and non-price variables on consumption of several types food-away-from-home (FAFH). Results show that outlet density is important, as are several demographic variables. An AIDS model of total food expenditure reveals that elasticities vary by type of FAFH facility.