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Demographic determinants of the consumption of food away from home

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DEMOGRAPHIC DETERMINANTS OF THE CONSUMPTION OF FOOD AWAY FROM HOME

by

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ABSTRACT

DEMOGRAPHIC DETERMINANTS OF THE CONSUMPTION OF FOOD AWAY FROM HOME

by

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A major trend in food expenditures over the past two decades has been the decline of food at home expenditures relative to food away from home expenditures. This dissertation identifies and examines the underlying demographic trends which are driving this consumer movement toward eating away from home. The methods employed are a variety of segmented regression analyses of panel data for several variables, including the percentage of women in the labor force and average family size. The primary result indicates that the driving force behind the expanding food away from home markets is a major demographic shift concerning the role of women in society and a changing family structure. A secondary result identifies fast food demand as a substitute for at home food consumption, while restaurant demand is associated with leisure

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INTRODUCTION

A major trend in food expenditures over the past few decades has been a shift in food consumption toward eating away from home. This trend has been recognized in the literature as early as 1970 by Houtaker and Taylor, and has been analyzed most recently in 1990 by Brown. The previous studies on food away from home have focused primarily on analyzing the price and income effects on aggregate food away from home consumption.[1] These studies represent the expanding food away from home market as a result of either a shifting relative price, or an increasing consumer income.

This approach to explaining the expanding food away from home markets is problematic on two accounts. First, by concentrating solely on aggregate food consumption patterns the previous studies have overlooked the important segments within food away from home consumption. Specifically, the previous studies have missed altogether the different roles the fast food and restaurant segments play. Second, the previous studies have for the most part limited their focus to traditional microeconomic price theory and techniques. Traditional microeconomic price theory has come under recent revision to include the importance of time allocation in the consumption decision. By analyzing the demand for food away from home in light of this revised consumer demand theory we are able to get an excellent view of the forces which are driving the expanding food away from home markets.

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1 Some researchers outside the field of economics have examined other issues including the effects of habit formation, convenience consumption, and the role of working housewives on the demand for food away from home

In this dissertation I analyze the demand for food away from home in light of the revised approach to consumer demand theory. The analysis is conducted in aggregate and by fast food and restaurant segment. Results indicate that the primary force in the shifting food demand is neither a changing relative price nor an increasing income; but rather a changing price of time in a households production function for food. This changing price of time for the household is a direct function of the changing role of women in society and a changing family structure.

REVIEW OF THE LITERATURE

A review of the pertinent literature is perhaps best accomplished by looking at two distinct bodies of literature; the new theory of consumer behavior and the demand for food away from home. What follows is a detailed description of the development of both bodies of knowledge. The relation of these two areas to the current research is discussed at the end.

The New Theory of Consumer Behavior

The new theory of consumer behavior was developed in the mid 1960's at Columbia University. This revised approach to price theory incorporates the cost of time in the households consumption decisions. It does this by asserting that households produce certain commodities by using inputs of market goods with their own time. Households then maximize this production subject to a budget and time constraint. The formal specification is analogous to the cost minimization process of the firm, except that the constraints and functions involved relate to the consumption decision process and the cost minimization behavior of the household.

This theory was set forth most prominently by Becker (1965) in his classic work "A Theory of the Allocation of Time". This article is the cornerstone to the allocation of time literature, and lays the foundation on which all other specifications are built. Further noteworthy additions to the theory set out by Becker include work by Michael and Becker (1973), Gronau (1980), Graham and Green (1984), and Kooreman and Kapteyn (1987).

Michael and Becker (1973) reassert Becker's theory by first reviewing the traditional theory of choice and pointing out its weaknesses. An approach similar to Becker's (1965) is then presented and advocated over the traditional theory of choice. The paper concludes by reviewing the areas in which the theory has already permeated, and evaluating the areas in which the theory should be applied in the future.

Gronau (1980) and Graham and Green (1984) formally expand the theory by introducing duality theory into the specification of the households production function. Specifically, they mathematically examine the characteristics of a Cobb-Douglas production function whose output is household production and whose inputs are household time and market goods. Graham and Green depart from Gronau by including the concept of jointness in production, where time spent producing commodities is jointly considered leisure time by the household. This specification of Becker's model was empirically tested by Graham and Green using 1976 University of Michigan data. Results indicated that the underlying assumptions of the production function model (i.e. type of returns to scale, orientation of human capital skills, and degree of jointness) greatly effected the parameter estimates of the model.

Kooreman and Kapteyn (1987) synthesize the results of Gronau (1977) and Graham and Green (1984) into one model termed the G-model. This model is empirically examined with the 1976 University of Michigan Survey data. This survey data contained detailed information on how people spend their time, and was thus well suited to test the G-model. Kooreman and Kapteyn's results for the most part validate the core of the G-model, with a minor number of issues arising over various special cases.

Empirical applications and extensions of Becker's theory have been widespread and broadreaching; addressing such diverse topics as sleep, unemployment, labor supply, and commodity demands. Each of these applications have implications for incorporating the theory of the allocation of time into the demand for food away from home. A brief review of some related topics follows.

Biddle and Hamermesh (1990) examine the effect of the allocation of time in the labor market on sleep. Their analysis is empirical and utilizes cross-sectional time diary data for twelve different countries. The results of their estimation associates a reduction in the amount of sleep with higher salaries and increases in time spent in the labor market. These effects were more pronounced amongst the males.

Deaton, Ruiz-Castillo, and Thomas (1989) propose a concept of demographic separability, and then test this concept against groups of goods they call "adult" goods. Their theory, in a nutshell, aims at testing if certain goods are independent of demographic characteristics, particularly the number of children in the family. The data they use to test this theory is 1981 survey data from Spain. The results of their formal analysis rejects the concept of demographic separability. However, the results did shed light on the secondary issue of measuring child costs, and they devise a unique method of calculating the marginal cost of a child for three different age groups.

Grossman (1973) analyzes unemployment and consumption in light of the theory of the allocation of time. He does this by looking at detailed family consumption expenditures before and during unemployment. The data Grossman uses is survey data from the Bureau of Employment Security on the insured unemployed from 1953 to 1958. A major result shows that secondary workers's time and market goods are a better substitutes in the production of household production than the primary market worker's time. This implication of this result, in light of the increased presence of secondary workers (women) in the market, is an increase in the fluctuations of consumption of certain goods. A minor result shows that the reduction in total consumption accompanying unemployment cannot be totally attributed to an income effect, but is partly due to the incentive to substitute time for goods in the production of commodities.

Ashenfelter and Abbott (1976), Wales and Woodland (1977), Browning, Deaton and Irish (1985), and Browning and Meghir (1991) address the issue of labor supply and commodity demands.

Ashenfelter and Abbott (1976) develop an integrated economic theory of the demand for commodities and the allocation of time. They then use this theory to estimate the demand for seven commodities (including food) along with an aggregate labor supply function. The data they used was aggregate time series data for the U.S. from 1927 to 1967. The technique employed was a maximum likelihood estimation. Their results extensively examine the effects of labor supply and wage rate on commodity demands, specifically price elasticities. Their research was somewhat pioneering, and as such one of their primary conclusions was that there is no great problem in incorporating labor supply behavior in the estimation of a complete set of demand functions. They stress that further research should focus on this technique.

Wales and Woodland (1977) argue for an alternative treatment of estimating labor supply and commodity demand systems. Their primary argument rallies around the point that leisure, which is included as an argument in the utility function, should be better defined than merely as time away from work (which is how it is usually defined). Their definition of leisure takes into account household production, by defining leisure as total time minus time spent at work and at household production. The data they use to test this paradigm is the 1971 University of Michigan survey data. The method they employ is a simultaneous, non-linear, maximum likelihood estimation. Their main conclusion is that their formulation of simultaneous estimation, particularly in regards to the definition of leisure, is superior.

Browning, Deaton, and Irish (1985) expand the topic by analyzing the labor supply and commodity demands system using integrated life-cycle models. The data they use to test their models is U.K. consumption and family labor supply panel data from 1970 to 1977. The results show a high correlation between male hours and male wages, with consumption peaking at high wage periods of the life cycle. Secondary results show hours and goods appearing to be substitutes, and the presence of children being associated with low, rather than high levels of consumption.

Browning and Meghir (1991) examine the possibility of separability of commodity demands from labor supply by estimating the demand for seven goods (including food) with the household labor supply. The data they use is U.K. family expenditure data from 1979 to 1984. The technique they employ is an instrumental variable estimation. Included in their specification of household labor is both participation and hours of work. The results show that labor supply (both hours and participation) have a definite effect on commodity demand patterns, and that this relationship fails separability.

In summary, the theory of the allocation of time has evolved over the years and spread into many areas of demand analysis, including the analysis of commodity demands in relation to labor supply. The specific implications the theory has for the demand for food away from home centers around the labor supply decision and the resulting effect on the allocation of time and commodity demands. These implications are discussed in detail after the review of the literature on the demand for food away from home.

The Demand for Food Away From Home

The literature on the demand for food away from home encompasses several disciplines and spans several decades. The review which follows is both comprehensive and extensive, however, not exhaustive. Our review starts with Houtaker and Taylor (1970) and ends with Blaylock, Smallwood, and Blissard (1991).

Houtaker and Taylor (1970) use a dynamic time series model of U.S. data from 1929 to 1965 to estimate and project the demand for 83 items, including purchased meals and food purchased for off-premise consumption. Results show that food consumed at home is subject to some sort of habit formation and, noteworthily, restaurant meals have the highest short-run own-price elasticities in the study. Their projections showed a moderate growth for both purchased meals and food purchased for consumption off premises.[2]

Anderson (1971) focuses on describing the convenience-oriented consumer. Specifically, he sets out to identify demographic correlates of convenience oriented behavior for selected families. The data he used was a 1,000 family questionnaire sample. The questionnaire asked detailed questions regarding the consumption of 52 convenience food items and 50 appliances and accessories. The findings regarding the food items showed a clear tendency of households with children toward convenience food consumption. And the higher the socioeconomic status (educational,

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2 Houtaker and Taylor, Consumer Demand in the United States, pg. 62

occupational, and income levels) the greater the tendency toward convenience foods. Income, on its own, was not sufficient to explain convenience food orientation.

Manser (1976) analyzed the demand for food in several categories using a non-additive utility function allowing for habit formation. And Christensen and Manser (1977) expand the research by focusing on the demand for meat. Both studies highlight the importance of habit formation on food demand. However, neither study focuses on food away from home demand.

Lamm (1982) analyzes the demand for food consumed both at and away from home. The translog utility model he employs is somewhat similar to the non-additive function employed by Manser, and he also allows for habit formation. Results show that rising consumer incomes, rather than changing relative prices are the reason for the consumer shift toward food away from home consumption.

Reilly (1982) examines the role of working wives in convenience consumption. The data he used was questionnaire data from 200 Milwaukee families in 1979. A LISREL IV maximum likelihood estimation showed a casual link between working wives and convenience consumption.

Nickols and Fox (1983) examine household production using a stepwise discriminant function analysis and stepwise regression analysis. The data they examine was comprised of a two day family time use diary of 1,639 two-parent, two-child families from a multi-state sample. Results showed that employed wives reduced the quantity of their household production to reduce time pressures. This reduction in household production included a substitution of purchased meals away from home for meals consumed at home.

Bellante and Foster (1984) analyze the effect of working wives on a variety of services, including aggregate food away from home. The data used was the interview component of the 1972-1973 Consumer Expenditure Survey. The data was analyzed with multiple regression analyses. The results concerning food away from home showed families with wives who were employed full time consuming a greater amount of food away from home than families of full-time homemakers.

Cage (1989) uses multivariate regression analyses, including Tobit regressions, to examine the spending differences across occupational fields. The data he examines is from the 1986 and 1987 interview surveys of the BLS Consumer Expenditure Survey. His results concerning food away from home show that expenditures on food away form home consumption is highest among managers and professionals, and lowest for the blue-collar group.

Rubin, Riney, and Molina (1990) examine the differences in expenditure patterns between dual-earner and single-earner households. Multivariate regression analysis is used on the 1972-1973 consumer expenditure survey. The results concerning food away from home show expenditure "almost constant among household types and over time, with the exception of income levels over $60,000". [3] The conclusion concerning all expenditure categories is that the income level is the most important determinant of expenditure between groups.

Brown (1990) builds a supply and demand model for restaurants and fast food, utilizing the Almost Ideal Demand system. The model was empirically evaluated with state data for the years 1977 and 1982. Results compare supply and

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3 *Journal of Consumer Research*, June 1990, pg. 48

demand elasticities between restaurants and fast food. Both had elastic supply curves, with the fast food places having a much more elastic supply curve compared to restaurants. As for demand, the demand for restaurants was found to be inelastic, whereas the demand for fast food was found to be close to unity.

Blaylock, Smallwood, and Blissard (1991) report the per capita food spending trends of the 1980's in detail. The major trend reported was a 6% decline in real spending on food at home consumption, with a 10% real increase in spending on food away from home consumption. The net of the two changes was a small decline in real total per capita food spending. The bulk of the growth in food away from home was explained by an increased popularity (and thus market share) of fast food outlets. The causation for these reported trends was not discussed.

In summary, the literature on the demand for food away from home encompasses several disciplines and spans several decades. The specific implications for the current research is discussed in detail in the next sub-section.

Implications for the Demand for Food Away From Home

The previous work on both the theory of the allocation of time and the demand for food is conclusive in giving direction for research on the demand for food away from home. The specific factors identified include both budget side factors of price and income and time value factors.

The literature on the new theory of consumer behavior clearly identifies the importance of time value factors on consumption decisions. Biddle and Hamermesh (1990) identify the importance of both salaries (wage rate) and time spent in the labor market (hours worked) on consumption. Deaton, Ruiz-Castillo, and Thomas (1989) identify the importance of demographic characteristics, particularly the number of children in the family (family size) on consumption. Grossman (1973) identifies the role of employment on consumption. Ashenfelter and Abbott (1976), Wales and Woodland (1977), and Browning and Meghir (1991) all identify the importance of labor supply decisions on commodity demands. In short, the literature on the new theory of consumer behavior includes hours worked, family size, and labor supply status as factors in determining commodity demands.

The literature on the demand for food away from home clearly identifies the importance of both prices and income and other non-pecuniary factors on food consumption. Houtaker and Taylor (1970), Manser (1976), Christensen and Manser (1977), and Lamm (1982) all identify the importance of both prices and income and habit formation on food consumption. Anderson (1971) identifies households with children (family size) as a relevant factor. Reilly (1982), Nickols and Fox (1983), Bellante and Foster (1984), and Rubin, Riney and Molina (1990) all identify the importance of working wives and dual earner households on food consumption decisions. In short, the literature on the demand for food away from home includes prices, income, habit formation, family size, and working women as factors in determining food consumption patterns.

In summary, the literature clearly suggests the factors which should be included in a study of the demand for food away from home. These factors include prices, income, labor supply, family size, and hours worked. The relationship of these factors to the demand for food away from home is discussed in detail in the next section, The Demand for Food Away From Home.

THE DEMAND FOR FOOD AWAY FROM HOME

The factors which the literature highlights for inclusion in a study of the demand for food away from home can be classified into two main categories; the budget side factors and the demographic factors used to proxy time value. This inquiry into the demand for food away from home analyzes the impact and importance of both of these factors on food away from home, including the fast food and restaurant segments.

The budget side factors involved in the demand for food away from home include an own price (price of food away from home), a cross price (the price for food at home), and income. The effects of these three factors are examined in conjunction with the effects of the demographic factors.

The demographic factors which have been identified and implicated in the demand for food away from home in both the food demand and time allocation literature all center around one fundamental demographic factor; the role of women in society and the resulting family structure. The specific factors identified in this research include the amount of women in the labor force, the amount of hours worked, the average family size, and the amount of singles in the population. The effect of these four factors are examined with and compared to the results on the budget side factors of prices and income.

The specific hypotheses postulated regarding prices and income do not differ that much from the general results prevalent in the literature. The price for food away from home is expected to be negatively related to food away from home in all segments. Intuitively, the less it costs to eat out, the more you will eat out in all segments. The price for food at home is expected to be positively related to food away from home, most notably in fast food, less so in restaurants. Intuitively, the more it costs to eat at home, the more you will substitute eating out for eating in, most notably for less expensive food items such as fast food. Finally, the income effect is expected to be positive for food away from home, most noticeably in restaurants. Intuitively, the higher your income the more you will substitute eating out for in, most notably in restaurants.

The specific hypotheses postulated for the demographic variables are straightforward. The amount of women in the labor force is expected to be positively related to food away from home in all segments. Intuitively, working women have a relatively higher value for leisure time, and they substitute eating out for at home meal preparation. Hours worked is expected to be positively related to all segments. Intuitively, an increase in hours worked increases the value of leisure time, and a substitution for eating out is made.[4] The average family size is expected to be negatively related to all segments, most notably restaurants. Intuitively, the larger the family size, the higher the relative cost of eating out due to economies of scale in at home food production.[5] And finally, the amount of singles in the population is expected to be positively related to food away from home in all segments, most notably in restaurants. Intuitively, singles have a relatively lower cost of eating out due to

4 Hours worked might possibly be negatively related to restaurant expenditures depending on the level

5 At home food production becomes less expensive in larger quantities. Food away from home, on the other hand, is priced constant per portion or serving.

economies of scale in at home food production, and singles dine in restaurants while dating.

Formally, in a regression where the expenditure on food away from home is the dependent variable (Y) and the other factors are independent variables ($X_1..X_7$) the coefficients ($B_1..B_7$) are expected to be:

B_1	> 0	where X_1 is the price of food at home
B_2	< 0	where X_2 is the price of food away from home
B_3	> 0	where X_3 is income
B_4	> 0	where X_4 is women in the labor force
B_5	< 0	where X_5 is average family size
B_6	> 0	where X_6 is hours worked
B_7	> 0	where X_7 is singles in the population

What follows is an empirical examination of the above hypotheses. I discuss the specific variables and data sources employed in examining these issues in the next section, Variables and Data Sources.

VARIABLES AND DATA SOURCES

The data used in this study is panel data, a combination of time series and cross sectional data. The time series element of the data is yearly observations for each area from 1981 to 1987, giving a total of 7 yearly observations for each area. Twenty four areas were chosen giving a total of 168 observations for the study. The areas are large Standard Metropolitan Statistical Area's (SMSA's) chosen by the Bureau of Labor Statistics to give a good representation of U.S. metropolitan areas.[6] The twenty four areas chosen are: Chicago, Detroit, Los Angeles-Long Beach, New York, Philadelphia, Baltimore, Boston, Cincinnati, Milwaukee, St. Louis, San Diego, Seattle, Washington D.C., Atlanta, Buffalo, Cleveland, Dallas-Ft. Worth, Houston, Kansas City, Minneapolis-St. Paul, Pittsburgh, San Francisco-Oakland, Denver-Boulder, and Miami.

The study analyzes a total of ten variables; three dependent and seven independent. Each variable has 168 observations; 7 years and 24 areas. The three dependent variables are; food away from home expenditure, fast food expenditure, and restaurant expenditure; each expressed in per capita terms. The seven independent variables are; the price of food at home, the price of food away from home, income, hours worked, family size, the amount of women in the labor force, and the amount of singles in the population.

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6 The areas used in the study were limited by the C.P.I. data. The U.S. Bureau of Labor Statistics limits their bi-monthly C.P.I. detailed shopping to these representative areas.

The data used for the three dependent variables was assembled by Market Statistics Inc. and published in annual editions of Restaurant Business Magazine. The definitions used for the SMSA groupings were the U.S. Census bureau definitions.

Food away from home expenditure was measured by sales in eating and drinking places. Eating and drinking place sales was used because it is the closest technical definition of food away from home expenditure. Eating and drinking place sales is defined as sales in "establishments selling prepared foods and drinks for consumption on or near the premises or for take-out; lunch counters and refreshment stands selling prepared foods and drinks for immediate food contractors; and leased eating and/or drinking concessions in theaters, hotels, amusement parks, etc."[7]

Restaurant expenditure was measure by sales in restaurants. Sales in restaurants was used because it is the closest technical definition of restaurant expenditure. Restaurant sales is defined as sales in "establishments engaged in serving prepared food and beverages selected by the patron from a full menu. Waiter or waitress service is provided and the establishment has seating facilities for at least 15 patrons."[8]

Fast food expenditure was measured by sales on fast food. Sales on fast food was used because it is the closest technical definition of fast food expenditure. Fast

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7 *Restaurant Business Magazine*, September 20, 1991, vol. 90 no. 14, pg. 120

8 Ibid

food sales is defined as sales in "establishments primarily selling limited lines of refreshments and prepared food items such as pizza, barbecued chicken, and hamburgers for consumption either on or near the premises or for carryout consumption."[9]

The sales data for all three dependent variables was given in aggregate nominal terms; specifically, in thousands of current dollars. Corresponding U.S. Census population figures were reported, also expressed in thousands. Per capita expenditure for each of the three dependent variables was thus calculated by dividing the sales figure in each SMSA by the corresponding population figure.

The data used for the seven independent variables came from four sources. These are the Consumer Price Index Detailed Report (B.L.S.), Employment, Hours, and Earnings, States and Areas: 1972-87 (B.L.S.), A Geographic Profile of Employment and Unemployment (B.L.S.), and Restaurant Business Magazine.

The price of food at home, price of food away from home, and the overall price index was measured by the Consumer Price Index for food at home, the Consumer Price Index for food away from home, and the overall Consumer Price Index respectively. These indices were used because of their widespread popularity and accessibility. The base year for the Consumer Price Index changed in 1986, thus the 1987 data was rebased to correspond to the old series.[10] The data was input to one decimal point. The source used was the Consumer Price Index Detailed Report.

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9 *Restaurant Business Magazine*, September 20, 1991, vol. 90 no. 14, pg. 120

10 The 1981 to 1986 data has a 1967 = 100 base. The 1987 data was rebased from a 1982 = 100 base to the 1967 = 100 base.

Income was measured by average weekly earnings. Average weekly earnings was used as opposed to hourly or yearly earnings because it is a good measure of disposable income. The data was given in nominal terms in hundreds of dollars, to two decimal points. The source used was Employment, Hours, and Earnings, States and Areas: 1972-87.

Hours worked was measured by average weekly hours. Average weekly hours was used because it is the standard measure of the amount of hours worked. The data was input to one decimal point. The source used was Employment, Hours, and Earnings, States and Areas: 1972-87.

Family size was measured by average family size. Average family size was used because it is the standard measure of family size. The data was input to two decimal points. The source used was Restaurant Business Magazine.

The amount of women in the labor force was measured by the percentage of women in the labor force. The percentage of women in the labor force was used because it is the standard measure of labor force participation. The data was input to one decimal point. The source used was A Geographic Profile of Employment and Unemployment.

The amount of singles in the population was measured by a calculated percentage of singles in the population. The calculated percentage of singles in the population was derived by dividing the total number of singles over age eighteen by the corresponding total population figure. The source used was Employment, Hours, and Earnings, States and Areas: 1972-87 for the singles population figure, and Restaurant Business Magazine for the total population figure.

In specifying the regression equations, most of the variables were converted from nominal to real terms. Also, relative prices were utilized, rather than absolute. I discuss the specifics of this data manipulation in detail in the next section, Model and Procedures.

MODEL AND PROCEDURE

The models used to test our hypotheses are multivariate regression models. The procedure emphasizes an empirical approach by starting with a basic OLS specification, then progressing on to the use of weighted regressions, a logarithmic specification, and dummy variable models. The primary model used is a basic OLS regression model defining the dependent variable as a function of seven independent variables. All variables are expressed in real terms, and all prices are expressed as relative prices. Specifically, the basic regression specification is:

$$\frac{Y}{cpia} = b_0 + b_1 \frac{cpia}{cpi} + b_2 \frac{cpih}{cpi} + b_3 \frac{wg}{cpi} + b_4\, fs + b_5\, wm + b_6\, sng + b_7\, hrs$$

where

Y = sales on food away from home by segment

b_0 = intercept

cpih = CPI food at home

cpia = CPI food away from home

wg = average weekly income

fs = average family size

hrs = average hours worked

wm = percentage of women in the labor force

sng = percentage of singles in the population

$b_{1\text{-}7}$ = beta coefficients for each variable

This OLS model is the first regression analyzed for all three segments, and it serves as the primary empirical base for examining our hypotheses. The empirical results from this basic equation are scrutinized in terms of equation fit and variable significance. Tests conducted on this specification include tests for multicollinearity, simple correlation between estimates, heteroskedasticity (from the cross sectional component), auto-correlation, and stationarity of variables (from the time series component). The specific tests conducted are the SAS collinearity diagnostics, an estimate correlation matrix, a scatter plot of squared residuals versus predicted value, a Durbin-Watson test for auto-correlation, and tests for unit roots.

The next procedural step taken is the specification of a weighted regression model. The weights used in this case are the square roots of the population for each SMSA. This is done to help reduce any heteroskedasticity which may arise from averaging over an unequal number of people in each SMSA. The results of the weighted regression are analyzed in light of the other equational specifications.

The next step is to account for the possibility of non-linearity in the variables. To account for the possibility of non-linearity in some of the variables, we invoke a logarithmic specification. As with our previous models, we are primarily interested in the effects this specification has on the equation fitness parameters and the significance and interpretation of the estimates. Any significant changes are analyzed carefully against the results of the other equational specifications.

The final and possibly most powerful procedure for checking the model is using dummy variables. By adding dummy variables we can quantitatively correct for such qualitative differences as differences between regions and across time. Because our data is panel data dummy variables are added for both time and regions, and for both time and regions alone. These final fixed effect dummy variable regression combinations are a very good check on all our previous procedural specifications.

After taking our basic OLS model and correcting for heteroskedasticity, adjusting for correlated variables and muiticollinearity, correcting non-linearity in the variables, and accounting for regional and time differences with dummies, we are still left with the possibility of biased estimators. There are apparently two main bias problems with the equational specification set forth in this section.

The first possible bias regards the coefficient of the relative price index for food away from home (cpia/cpi). Specifically, the coefficient of the price index for food away from home (cpia/cpi) in a regression in which real sales on food away from home (Y/cpia) is the dependent variable is biased away from zero if the price index (cpia) is measured with error. The extent of this bias problem is determined by the extent of the error of measurement prevalent in the Bureau of Labor Statistics data. While not expected to be a major problem, this possible bias will be kept in mind when interpreting the results.

The second bias is introduced through the proxy variable of the labor force participation rate of women (wm). As stated previously in our exposition, we use the labor force participation rate of women to proxy the value of their time. The main problem with using this variable, however, is that it is endogenous to our equation specification. Moreover, the labor force participation rate of women (wm) is correlated with the error term of our equation specification.[11] Therefore, we must also

11 A formal proof is presented in the appendix

be careful in interpreting the results regarding the percentage of women in the labor force, as the estimator has a bias problem.

The above described model and procedure was implemented with the data and variables discussed in the previous section. I discuss the results of this examination in detail in the next section, Results.

RESULTS

The results of the study were very strong. In every single regression equation specified the variables which were estimated significantly[12] had a slope coefficient whose sign and magnitude was exactly as our hypotheses predicted. The two variables of particular interest, namely the percentage of women in the labor force and the average family size, proved to be highly significant in practically every equation specified. Moreover, these two variables were amongst the most important factors in explaining food away from home demand. The results on the relative prices and income were consistent with the general results prevalent in the literature. In fact, only one variable did not confirm our hypothesis, and this was average weekly hours worked.

A detailed description of the results follows below in the following format. First, I will discuss in general terms the various equations specified, the goodness of fit of these equations, and the techniques employed in testing the equations. Second, I will discuss in detail the results of the individual regression equations by segment. Third, I will summarize these findings by looking at the individual variables and their effects on all three segments. Finally, I will analyze the contribution each of these variables has on food away from home by segment.

The Fitness of Equations

Eighteen separate primary regression equations were specified and computed for the current study. These included OLS, weighted OLS, logarithmic, and

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12 Significance in this report is defined as significance at greater then a 90% confidence interval of the t-statistic. Insignificance as less then 90%, and highly significant greater then 99%.

dummy variable specifications. R-squared in the study ranged from a low of .3591 to a high of .9640. The significance of the equation F statistic remained constant throughout the various equational specifications at the .0001 level. The specific equation statistics for each equation are presented in the appendix and are cited in the estimated equations sub-section below.

An overall test for multicollinearity was conducted using the SAS collinearity diagnostics. The approach taken by SAS in analyzing multicollinearity is similar to the approach taken by Belsey, Kuh, and Welsch (1980). Under this approach, multicollinearity can be considered to be a problem "when a component associated with a high condition number contributes strongly to the variance of two or more variables".[13] The highest condition index in our model was 160.67, with the highest proportions of variance only .31 and .55. All the other results do not even hint of multicollinearity. Detailed results of the collinearity analysis can be found in the appendix.

A correlation matrix of the estimates was also generated to test for correlation between individual variables. Simple correlation coefficients ranged from a low of -.0026 to a high of .5716. Correlation between most of the variables was very low. Out of all 28 unique comparisons, only 3 ranked above .4, with 16 falling below .2, and 10 of these below .1. The correlation matrix can be found in the appendix.

Concerns over heteroskedasticity in the equations arose primarily because of the different population sizes of the various SMSA's in the cross-sectional component of the data. To correct for this possibility weighted regressions were

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13 SAS Institute, <u>SAS Statistics Guide</u>, pg 672

specified for each of the three segments, where the weights were the square root of the population. The results between the OLS and weighted regressions did not vary that much, and are described in detail below. A final test for heteroskedasticity was performed using a scatter plot of the squared residuals versus the predicted values. No predominant patterns were found in the scatter plots. Scatter plots for all three segments can be found in the appendix.

A test for autocorrelation was performed on the twenty four individual time series components using the Durbin-Watson test for autocorrelation. Nine of the twenty four areas failed the Durbin-Watson test for autocorrelation at the five percent significance level. With only seven observations in the time series component, these results are somewhat questionable. Nevertheless, a two-thirds pass rate is not bad at all. The results of the Durbin-Watson test for autocorrelation can be found in the appendix.

Finally, the time series components of all the variables were tested for stationarity using the Dickey-Fuller test for unit roots. Less than five percent of the cases showed evidence of non-stationarity by exhibiting a unit root. Again, with only seven observations in the time series component, these results are somewhat questionable. Nevertheless, the results are encouraging news about the health of the time series component. The results of the Dickey-Fuller test for unit roots can be found in the appendix.

In summary, the overall fitness of the equations appears excellent. Multicollinearity, correlation amongst the estimates, heteroskedasticity, autocorrelation, and non-stationarity were not present in alarming proportions. All the equation fitness statistics looked good. Overall, the estimates described below appear highly reliable.

The Estimated Equations

The results for the OLS, weighted OLS, logarithmic, and dummy variable specifications, including dummies for areas and time, areas, and time alone, are presented in Tables 1 to 4 in the main text. A more detailed presentation can be found in the appendix. A description of the results by segment follows below.

Food Away From Home

The equation fitness parameters for food away from home suggest a relatively good equation fit. R^2 ranged from a low of .4271 for the weighted OLS specification to a high of .9561 for the dummy variable specification (with dummy variables added for areas and years). The F value ranged from a low of 9.189 to a high of 96.780, with the probability greater than F reaching only .0001. Combined with the extensive tests previously discussed, these statistics indicate an excellent equational specification for food away from home, and they suggest that the parameter estimates are reliable.

The parameter estimates for food away from home are presented in Table 2. The results clearly show the significance of the relative C.P.I. for food away from home, the average weekly wage, the average family size, and the percentage of women in the labor force in determining food away from home expenditures. Moreover, these four variables are the only significant variables in the non-dummy variable specifications. When dummy variables are added, the relative C.P.I. becomes insignificant in two specifications, with the results for wages, family size, and women in the labor force remaining consistently strong. The percentage of singles

TABLE 1

Ordinary Least Squares Regression Coefficients for Food Away From Home Expenditures by Segment

Independent Variables	Food Away From Home	Restaurants	Fast Food
Relative C.P.I for food away from home	-1.683** (.403)	-0.910** (.246)	-0.489** (.117)
Relative C.P.I. food at home	1.003 (.773)	-0.090 (.471)	0.752** (.225)
Average Weekly Wages	1.008** (.276)	0.634** (.168)	0.201** (.080)
Average Family Size	-2.529** (.381)	-1.941** (.232)	-0.097 (.111)
% Women in the Labor Force	2.900** (.007)	1.303** (.004)	1.312** (.192)
% Singles in the population	0.617 (1.222)	0.877 (.745)	-0.942** (0.356)
Average Weekly Hours Worked	-.035 (.031)	-0.024 (.019)	0.000 (.009)
Equation R^2	.4271	.4791	.3591

1. * Denotes significance at greater than the .05 level of the t-dist.
2. **Denotes significance at greater than the .01 level of the t-dist.
3. The figures in the parentheses are the standard errors

TABLE 2

FOOD AWAY FROM HOME

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-1.683** (.403)	-1.716** (.341)	-1.829** (.432)			-1.924** (.441)
Relative C.P.I. food at home						
Average Weekly Wages	1.008** (.276)	0.623** (.247)	1.450** (.366)	0.857** (.394)	0.885** (.341)	0.904** (.290)
Average Family Size	-2.529** (.381)	-2.900** (.351)	-6.820** (.971)	-1.540** (.566)	-1.702** (.483)	-2.354** (.407)
% Women in the Labor Force	2.900** (.007)	2.991** (.030)	1.735** (.362)		2.060** (.008)	2.698** (.007)
% Singles in the population				3.570** (.806)	3.111** (.722)	
Average Weekly Hours Worked						
Equation R^2	.4271	.4172	.4469	.9561	.9549	.4368

1. Ommitted coefficients were estimated at less than the .05 level of the t-distribution
2. * Denotes significance at greater than the .05 level of the t-distribution
3. **Denotes significance at greater than the .01 level of the t-distribution
4. The figures in the parantheses are the standard errors
5. All variables are in real terms

TABLE 3

RESTAURANTS

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-0.910** (.246)	-1.043** (.215)	-0.997** (.263)			-0.983** (.268)
Relative C.P.I. food at home						
Average Weekly Wages	0.634** (.168)	0.355** (.156)	0.910** (.223)		0.620** (.213)	0.604** (.176)
Average Family Size	-1.941** (.232)	-1.602** (.222)	-5.202** (.971)			-1.894** (.247)
% Women in the Labor Force	1.303** (.004)	1.205** (.004)	0.790** (.362)		1.166** (.005)	1.255** (.004)
% Singles in the population				2.472** (.472)	2.259** (.451)	
Average Weekly Hours Worked						
Equation R^2	.4791	.4233	.4964	.9631	.9569	.4914

1. Ommitted coefficients were estimated at less than the .05 level of the t-distribution
2. * Denotes significance at greater than the .05 level of the t-distribution
3. **Denotes significance at greater than the .01 level of the t-distribution
4. The figures in the parantheses are the standard errors
5. All variables are in real terms

TABLE 4

FAST FOOD

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-0.489** (.117)	-0.513** (.099)	-0.516** (.126)	-0.253** (.095)	-0.262** (.076)	-0.584** (.125)
Relative C.P.I. food at home	0.752** (.225)	0.516** (.219)	0.734** (.206)			0.911** (.235)
Average Weekly Wages	0.201** (.080)		0.302** (.107)	0.281** (.098)	0.284** (.087)	
Average Family Size				-0.838** (.141)	-0.894** (.124)	
% Women in the Labor Force	1.312** (.192)	1.360** (.166)	0.769** (.106)			1.221** (.194)
% Singles in the population	-0.942** (.356)	-0.866** (.309)	-0.164** (.067)			-1.459** (.382)
Average Weekly Hours Worked				-0.015** (.007)	-0.012** (.005)	
Equation R^2	.3591	.5054	.3748	.9640	.9611	.4054

1. Ommitted coefficients were estimated at less than the .05 level of the t-distribution
2. * Denotes significance at greater than the .05 level of the t-distribution
3. **Denotes significance at greater than the .01 level of the t-distribution
4. The figures in the parantheses are the standard errors
5. All variables are in real terms

Table 5

Weigted Mean Value of Variables: 1981 to 1987

Year	Food Away From Home	Restau- rants	Fast Food	CPI Away	CPI Home	Avg. Wages	%Single in pop.	Fam. Size	%Women Labor	Avg. Hrs.
1981	$175.75	$79.85	$57.17	1.06	0.99	$127.01	19.01%	2.71	53.33%	40.06
1882	$184.93	$83.10	$61.15	1.05	0.97	$126.45	21.76%	2.69	54.11%	39.23
1983	$188.96	$96.50	$59.56	1.06	0.94	$130.76	21.79%	2.69	54.50%	40.01
1984	$192.66	$92.70	$62.56	1.06	0.93	$132.19	21.59%	2.69	55.05%	40.67
1985	$195.19	$95.89	$61.29	1.10	0.93	$134.19	21.83%	2.67	55.84%	40.57
1986	$200.43	$95.13	$62.26	1.13	0.94	$135.74	21.93%	2.66	56.16%	40.81
1987	$202.26	$97.30	$63.15	1.12	0.94	$134.52	22.18%	2.66	56.90%	41.13

1. Mean values were weighted by the population of the respective SMSA.
2. Food expenditures and Average Wages are annual per capita figures expressed in 1967 dollars.
3. The CPI figures for away from and at home are relative price indeces (i.e. CPI / overall CPI).

TABLE 6

Partial Expenditure Elasticities for Food Away From Home by Segment

Independent Variables	Food Away From Home	Restau- rants	Fast Food
Relative C.P.I for food away from home	-1.829	-0.997	-0.516
Relative C.P.I. food at home	1.132	0.032	0.734
Average Weekly Wages	1.450	0.910	0.302
Average Family Size	-6.820	-5.202	-0.273
% Women in the Labor Force	1.735	0.790	0.769
% Singles in the population	0.151	0.182	-0.164
Average Weekly Hours Worked	-1.669	-1.131	-0.110

TABLE 7

Contribution of Selected Factors on Food Away From Home by Segment

Independent Variables	Food Away From Home	Restau-rants	Fast Food
Relative C.P.I for food away from home	-10.5	-5.9	-3.1
Relative C.P.I. food at home	-4.4	3.9	-3.3
Average Weekly Wages	7.6	4.8	1.5
Average Family Size	12.6	9.7	0.5
% Women in the Labor Force	10.4	4.6	4.6
% Singles in the population	2.0	2.8	-3.0
Average Weekly Hours Worked	-3.7	-2.6	0.0
Actual Change in Expenditure[1]	$26.51	$17.45	$5.98
Predicted Change in Expenditure[2]	$14.00	$17.30	-$0.03
Percent Explained	52.8%	99.1%	0.0%

1. Change in Expenditure is for the time period 1981 to 1987 and is calculated from Table 5
2. Predicted Change is computed by summing the contribution factors

in the population was insignificant in the non-dummy specifications, but has some indication of significance in the dummy variable equations. The relative C.P.I. for food at home and the average weekly hours worked were insignificant across all equations.

The signs and magnitudes of the parameters estimated significantly were markedly consistent throughout the various regression specifications. The actual effects on real expenditures for food away from home for the four clearly significant variables can be implied from the slope coefficients. Moreover, for every 1% decrease in the relative C.P.I. for food away from home we can expect to see a $171 increase in yearly per-capita expenditure on food away from home.[14] Likewise, for each dollar increase in real weekly income, we can expect to see a $62.23 increase in food away from home expenditure. For an increase of 1 person in average family size we can expect to see a $290 decrease in food away from home expenditure. And for each 1% increase in the percentage of women in the labor force we can expect to see a $299 increase in food away from home expenditure. Finally, if the suggestion of the dummy variable runs are correct, we can expect to see a $311 increase for each additional percent of singles in the population.

Restaurants

The equation fitness parameters for restaurants suggest a relatively good equation fit. R^2 ranged from a low of .4233 for the weighted OLS specification to a high of .9631 for the dummy variable specification (with dummy variables added for areas and years). The F value ranged from a low of 11.446 to a high of 101.476, with

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14 Figures discussed in the results section are current expenditure figures expressed in 1967 dollars.

the probability greater than F reaching only .001. Combined with the extensive tests previously discussed, these statistics indicate an excellent equational specification for restaurants, and they suggest that the parameter estimates are reliable.

The parameter estimates for restaurants are presented in Table 3. The results clearly show the significance of the relative C.P.I. for food away from home, the average weekly wage, the average family size, and the percentage of women in the labor force in determining restaurant expenditures. Moreover, as with food away from home expenditure, these four variables are the only significant variables in the non-dummy variable specifications. When dummy variables are added the results change somewhat. The relative C.P.I. for food away from home and the average family size becomes insignificant in both the area and area and time dummy variable specifications. And the average weekly wage becomes insignificant in the area and time dummy equation. As with food away from home expenditures, the percentage of singles in the population has some indication of significance in the dummy variable equations, and the relative C.P.I. for food at home and the average weekly hours worked were insignificant across all equations.

The signs and magnitudes of the parameters estimated significantly were markedly consistent throughout the various regression specifications. The actual effects on real expenditures in restaurants for the four clearly significant variables can be implied from the slope coefficients. Moreover, for every 1% decrease in the relative C.P.I. for food away from home we can expect to see an approximately $104 increase in real, yearly, per-capita expenditure in restaurants. Likewise, for each dollar increase in real weekly income, we can expect to see an approximately $35.50 increase in restaurant expenditure. For a decrease of 1 person in average family size we can expect to see an approximately $160 increase in restaurant expenditure. And for each 1% increase in the percentage of women in the labor force we can expect to see a $120 increase in food away from home expenditure. Finally, if the suggestion of the dummy variable equations are correct, we can expect to see an approximately $225 increase for each additional percent of singles in the population.

<u>Fast Food</u>

The fitness equation parameters for fast food suggest a relatively good equation fit. R^2 ranged from a low of .3591 for the OLS specification to a high of .9640 for the dummy variable specification (with dummy variables added for areas and years). The F value ranged from a low of 8.077 to a high of 112.887, with the probability greater than F reaching a high of only .0001. Combined with the extensive test results previously discussed, these statistics indicate an excellent equational specification for fast food, and they suggest that the parameter results are reliable.

The parameter estimates for fast food are presented in Table 4. The results clearly show the significance of the relative C.P.I. for food away from home, the relative C.P.I. for food at home, the percentage of women in the labor force, and the percentage of singles in the population. These four variables were significant in the weighted regression specification and at least three other specifications. The average weekly wage showed significance in four different specifications, with the average family size and average weekly hours showing significance in only two dummy variable specifications. The solid significance of the relative C.P.I. for food at home in four equations is the noteworthy and unique characteristic of fast food.

The signs and magnitudes of the parameters estimated significantly were markedly consistent throughout the various regression specifications. The actual effects on real expenditures on fast food can be implied from the slope coefficients. Moreover, for every 1% decrease in the relative C.P.I. for food away from home we can expect to see a $51 increase in real, yearly, per-capita fast food expenditure. For every 1% decrease in the relative C.P.I. for food at home we can expect to see a $51 decrease in fast food expenditure. For each 1% increase in the percentage of women in the labor force we can expect to see a $136 increase in food away from home expenditure. And finally, for each 1% decrease in the singles in the population we can expect to see a $86 increase in fast food expenditure.

Summary of Findings

A summary of the findings is perhaps best accomplished by looking at the individual variables themselves and then showing the relationship between the hypotheses and empirical evidence. Presented below is a summary of the more important results.

The relative C.P.I. for food away from home

The relative C.P.I. for food away from home was solidly significant for food away from home, restaurant, and fast food expenditures. The sign for all three segments was negative, as our hypothesis suggested. The trend in the C.P.I. for food away from home from 1981 to 1987 was downward, while the corresponding trend for all three food segments was upward.[15] The empirical evidence in both regression estimation and trend presentation is clear. The lower the relative price for food away from home, the greater the expenditures on food away from home, restaurant

15 Trends can be examined from Table 5

dining, and fast food expenditure. This result is consistent with both our hypothesis and the general results prevalent in the literature.

The relative C.P.I. for food at home

The relative C.P.I. for food at home was estimated to be insignificant for food away from home and restaurant dining, but significant for fast food expenditure. The sign was positive for fast food expenditure, as our hypotheses predicted. The trend in the relative C.P.I. for food at home from 1981 to 1987 was upward, as was the trend for food expenditures in all three segments. The empirical evidence of both trend and regression analysis is clear. The higher the relative price of food at home, the higher the expenditure on fast food, with expenditure in restaurants and food away from home being apparently independent of cross price effects. This result confirms and expands our hypothesis.

The average weekly wage

The average weekly wage was estimated to be solidly significant to food away from home and restaurant expenditures, with evidence of significance on fast food expenditures. The sign for all three segments was positive, as our hypothesis suggested. The trend of the average weekly wage from 1981 to 1987 was upward, as was the trend for all three food segments. The empirical evidence of both trend and regression analysis is clear. The higher the average weekly wage the higher the expenditure on food away from home and restaurant expenditures, with a probable increase in fast food expenditure. This result confirms and expands our hypothesis.

The average family size

The average family size was solidly significant for food away from home and restaurant, with a hint of significance for fast food. The sign for all three segments was negative, as our hypothesis suggested. The trend in the average family size from 1981 to 1987 was downward, with the corresponding trend for food demand in all three segments being upward. The empirical evidence of both trend and regression analysis is clear. The lower the average family size, the higher the expenditures on food away from home, restaurants, and possibly fast food. This result confirms our hypothesis.

The percentage of women in the labor force

The percentage of women in the labor force was solidly significant in almost every regression equation specified. The sign was positive in all three segments, as our hypothesis suggested. The trend in the percentage of women in the labor force from 1981 to 1987 was upward, as was the trend for food expenditures in all three segments. The empirical evidence of both trend and regression analysis is clear. The higher the percentage of women in the labor force, the higher the expenditures on food away from home, restaurants, and fast food. This result confirms our hypothesis.

The percentage of singles in the population

The percentage of singles in the population was significant for food away from home and restaurant in two of the dummy variable equations, and significant for fast food in four equations. The sign was positive in all three segments, as our hypothesis suggested. The trend in the percentage of singles in the population from 1981 to 1987 was upward, as was the trend in all three segments. The empirical evidence is not crystal clear. However, the regression output and particularly the trend analysis suggests a positive relationship between the percentage of singles in the population and expenditures on both food away from home and restaurants. A negative relationship is suggested for fast food. This result confirms and expands our hypothesis.

The average weekly hours worked

The average weekly hours worked was estimated to be insignificant in all but two equations specified. An examination of the trend in average hours worked from 1981 to 1987 shows average weekly hours worked remaining relatively constant, and actual falling several times during the period. Food expenditure, on the other hand, clearly trended upward in all three segments. The empirical evidence is not crystal clear. The trend from 1981 to 1987 for average weekly hours worked was fairly erratic. Perhaps a longer time period with a clearer trend in hours worked would clarify the effect of hours worked on food demand. The current research, however, establishes no clear effect of average weekly hours worked on food away from home expenditure, and does not support our initial hypothesis.

In summary, the empirical results give a clear indication of the validity of our initial hypotheses.[16] The results concerning the C.P.I. for food away from home, the percentage of women in the labor force, and the average family size clearly confirm our hypotheses. The results concerning the C.P.I. for food at home expand our hypothesis by highlighting the substitution toward fast food consumption as the price of food at home rises. The results concerning the average weekly wage expand our hypothesis by emphasizing the effect of an increasing income on restaurant dining.

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16 The hypotheses are presented in The Demand for Food Away from Home section

The only hypothesis not supported at all by the results concerns average hours worked.

Ranking of Estimates

The empirical results of the study clearly establish a relationship between the percentage of women in the labor force and the average family size with the demand for food away from home by segment. The results are also consistent with the general results prevalent in the literature concerning prices and income. But to what extent do each of these variables effect the demand for food away from home by segment, and which of the variables are more important? A ranking of the estimates will shed some light on this issue.

A ranking of the estimates is performed in this research using two related methods; expenditure elasticities and a parameter contribution calculation. The expenditure elasticities are estimated to give an initial glance at the relative importance of each parameter in explaining food expenditure by segment. A parameter contribution calculation on the time series differential is made to discern the relative importance of each parameter in explaining the differential shift in food expenditures over time.

Partial Expenditure Elasticities

The partial expenditure elasticities are presented in Table 6. These statistics show the demographic variables of average family size and percentage of women in the labor force having at least the same importance in food demand by segment as either prices or income. The specific importance differs slightly between segments.

The elasticity calculation concerning food away from home expenditures appear most greatly affected by the average family size (E = -6.820). Average family size is followed in relative importance by the relative C.P.I. for food away from home (E = -1.829), the percentage of women in the labor force (E = 1.735) and the average weekly wage (E = 1.450). Clearly the demographic variables are on par or more important then the prices or income.

The elasticity calculations concerning restaurant expenditures suggest average family size (E = -5.202) as the primary factor in explaining restaurant demand. The relative C.P.I. for food away from home (E = -0.997) follows, with the average weekly wage (E = 0.910) and percentage of women in the labor force (E = 0.790) taking up third and forth place respectively. Family size again is the primary factor, with the percentage of women in the labor force making a good showing.

The elasticity calculations concerning fast food expenditures suggest the percentage of women in the labor force (E = .769) as the primary explanatory factor. The relative C.P.I. for food at home follows (E = .734), with the relative C.P.I for food away from home trailing slightly behind (E = .516). The percentage of singles in the population ranks last (E = .164). The percentage of women in the labor force is clearly the primary factor determining fast food expenditure. The secondary factor is clearly the relative C.P.I. for food at home. This secondary factor highlights the substitutionary role fast food plays to food at home demand.

The combined results clearly highlight the importance of the demographic variables in the demand for food away from home by segment. Moreover, the primary explanatory factors effecting the demand for food away from home are the average family size and the percentage of women in the labor force.

Contribution to Trend

The calculated contribution to trend statistics are presented in Table 7.[17] These statistics confirm and expand the expenditure elasticity results by highlighting the dominating role of the demographic variables.

The share calculations concerning food away from home account for a total of 52% ($14.00) of the actual $22.51 increase in food away from home expenditure. Three contributory factors were identified as having a negative effect, while four contributory factors were identified as having a positive effect on food away from home expenditure. The factors identified as having a negative effect on food away from home expenditure are the relative C.P.I. for food away from home (S = -10.5), the relative C.P.I. for food at home (S = -4.4), and the average weekly hours worked (S = -3.7). The relative C.P.I. for food away from home was the largest negative factor and was the only negative factor estimated significantly. The four factors identified as having a positive effect on food away from home expenditure are the average family size (S = 12.6), the percentage of women in the labor force (S = 10.4), the average weekly wage (S = 7.6), and the percentage of singles in the population (S = 2.0). All four were at some point in the study estimated significantly.

The net positive prediction for food away from home expenditure over the seven year period is a clear result of the dominance of the positive factors over the

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17 Contributions to trend were calculated by taking the change in the mean value of a variable from its 1981 to 1987 value, and then multiplying this change by the relevant slope coefficient. The sign and magnitude of the resulting contribution to trend figure is dependent on both the sign and magnitude of the estimated coefficient (Appendix A1 to A3) and the direction and magnitude of the trend (Table 5)

negative factors. Specifically, it is the decreasing average family size and increasing percentage of women in the labor force which are the dominant contributory factors in the expanding food away from home market. These demographic factors override the negative factors and are the driving force behind the expansion in food away from home expenditure.

The share calculations concerning restaurants account for a total of 99.1% ($17.30) of the actual $17.45 increase in expenditure. Two contributory factors were identified as having a negative effect, while five contributory factors were identified as having a positive effect on restaurant expenditure. The factors identified as having a negative effect on restaurant expenditure are the relative C.P.I. for food away from home (S = -5.9) and the average weekly hours worked (S = -2.6). The relative C.P.I. for food away from home was the largest negative factor and was the only negative factor estimated significantly. The five factors identified as having a positive effect on food away from home expenditure are the average family size (S = 9.7), the average weekly wage (S = 4.8), the percentage of women in the labor force (S = 4.6), and the percentage of singles in the population (S = 2.8). All five were at some point in the study estimated significantly.

The net positive prediction is again a clear result of the dominance of the positive factors over the negative factors. Specifically, it is the decreasing average family size and increasing percentage of women in the labor force which are the dominant contributory factors in the expanding restaurant market. These demographic factors override the negative factors and are the driving force behind the expansion in restaurant expenditure.

The share calculations concerning fast food account for a total of 0.0% (-$0.03) of the actual $5.98 increase in expenditure. Three contributory factors were identified as having a negative effect, while four contributory factors were identified as having a positive effect on fast food expenditure. The factors identified as having a negative effect on fast food expenditure are the relative C.P.I. for food at home (S = -3.3), the relative C.P.I. for food away from home (S = -3.1), and the percentage of singles in the population (S = 3.0). The four factors identified as having a positive effect on fast food expenditure are the percentage of women in the labor force (S = 4.6), the average weekly wages (S = 1.5), the average family size (S = 0.5), and the average weekly hours worked (S = 0.0). The percentage of women in the labor force was by far the largest positive contributory factor and outweighed all other positive factors combined.

The net negative (near zero) prediction is a result of the strong negative effect of both prices and the percentage of singles in the population. A contributory factor is the weak positive effect of the average family size. Despite these effects, the percentage of women in the labor force dominates the market and is clearly the driving force behind the demand for fast food.

The partial expenditure elasticities and calculated shares in trend explanation when viewed together give a clear representation of the relative importance of the various significant factors involved in the demand for food away from home by segment. The combined analysis identifies the demographic factors as the dominant force in explaining the expanding food away from home markets by segment. Specifically, the dominant factors identified by both elasticity and calculated contribution to trend are the average family size and percentage of women in the labor force. These two factors combined with the percentage of singles in the population override the negative effects on expenditure and are the driving forces behind the expanding food away from home markets. These demographic shifts are all related to one underlying trend concerning the changing role of women in society and the resulting family structure. This trend should continue to have a great impact on food demand patterns in the future.

CONCLUSION

This dissertation has empirically examined the nature of the demand for food away from home in light of the new theory of consumer behavior. The analysis was both in the aggregate and by fast food and restaurant segment. The empirical examination has established a definite relationship between several key demographic variables and the demand for food away from home. The relationship established concerns a major shift in the demographic makeup of America. This shift should continue to effect consumption patterns well into the twenty-first century.

The fundamental relationship identified, and ultimate driving force behind the expanding food away from home markets, concerns the changing role of women in our society and the resulting change in family structure.[18] The economic impact of this demographic shift is embodied in both a changing price of time for the household unit and a changing cost of production of household commodities. This relationship stands out as the primary explanatory factor of food away from home demand when compared to the pure price and income effects.

A secondary relationship identified concerns the differentiation between fast food and restaurant segments. Fast food demand has been identified as primarily a substitute for food at home. Restaurant demand, on the other hand, is identified as more of a leisure related demand. Both segments are driven and greatly influenced by the demographic determinants.

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18 Specifically, the increase of women in the labor force, decrease in average family size, and increase in the percentage of the singles in the population.

The significance and importance of these findings should be evident not only to economists, researchers, and policymakers in the food industry, but to the academic community at large. The demographic shift identified as the force behind the expanding food away from home markets is a major shift in the basic element of society. The effects of this shift will reach beyond consumption patterns and have a profound impact on the very structure and nature of our workplace, our homelife, and the society in which we live.

A1: FOOD AWAY FROM HOME

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-1.683** (.403)	-1.716** (.341)	-1.829** (.432)	-0.542 (.381)	-0.236 (.298)	-1.924** (.441)
Relative C.P.I. food at home	1.003 (.773)	0.128 (.754)	1.132 (.705)	0.376 (.739)	0.162 (.513)	1.096 (.832)
Average Weekly Wages	1.008** (.276)	0.623** (.247)	1.450** (.366)	0.857** (.394)	0.885** (.341)	0.904** (.290)
Average Family Size	-2.529** (.381)	-2.900** (.351)	-6.820** (.971)	-1.540** (.566)	-1.702** (.483)	-2.354** (.407)
% Women in the Labor Force	2.900** (.007)	2.991** (.030)	1.735** (.362)	1.432 (.891)	2.060** (.008)	2.698** (.007)
% Singles in the population	0.617 (1.222)	-0.188 (1.063)	0.151 (.229)	3.570** (.806)	3.111** (.722)	-0.087 (1.350)
Average Weekly Hours Worked	-0.035 (.031)	-0.016 (.030)	-1.670 (1.251)	-0.046 (.028)	-0.020 (.021)	-0.048 (0.035)
Equation R^2	.4271	.4172	.4469	.9561	.9549	.4368
Adj R^2	.4020	.3917	.4227	.9440	.9451	.3893
F Value	17.039	16.365	18.466	79.263	96.780	9.189
Prob > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

A1: RESTAURANTS

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-0.910** (.246)	-1.043** (.215)	-0.997** (.263)	-0.376 (.223)	-0.201 (.186)	-0.983** (.268)
Relative C.P.I. food at home	-0.090 (.471)	-0.464 (.476)	0.032 (.430)	0.137 (.433)	-0.630 (.320)	0.017 (.505)
Average Weekly Wages	0.634** (.168)	0.355** (.156)	0.910** (.223)	0.438 (.230)	0.620** (.213)	0.604** (.176)
Average Family Size	-1.941** (.232)	-1.602** (.222)	-5.202** (.971)	-0.614 (.332)	-0.394 (.302)	-1.894** (.247)
% Women in the Labor Force	1.303** (.004)	1.205** (.004)	0.790** (.362)	0.687 (.522)	1.166** (.005)	1.255** (.004)
% Singles in the population	0.877 (.745)	0.615 (.672)	0.182 (.140)	2.472** (.472)	2.259** (.451)	0.636 (.820)
Average Weekly Hours Worked	-0.024 (.019)	-0.008 (.019)	-1.131 (.763)	-0.013 (.016)	-0.000 (0.013)	-0.032 (.021)
Equation R^2	.4791	.4233	.4964	.9631	.9569	.4914
Adj R^2	.4563	.3980	.4744	.9530	.9475	.4485
F Value	21.024	16.774	22.531	95.069	101.476	11.446
Prob > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

A1: FAST FOOD

Ordinary Least Squares, Weighted Least Squares, Logarithmic, and Dummy Variable Regression Coefficients for Food Away From Home Expenditures

Independent Variables	Ordinary Least Squares	Weighted Least Squares	Log Equation	Dummies for Area and Time	Dummies for Area	Dummies for Time
Relative C.P.I for food away from home	-0.489** (.117)	-0.513** (.099)	-0.516** (.126)	-0.253** (.095)	-0.262** (.076)	-0.584** (.125)
Relative C.P.I. food at home	0.752** (.225)	0.516** (.219)	0.734** (.206)	0.087 (.184)	-0.026 (.131)	0.911** (.235)
Average Weekly Wages	0.201** (.080)	0.119 (.072)	0.302** (.107)	0.281** (.098)	0.284** (.087)	0.134 (.082)
Average Family Size	-0.097 (.013)	-0.074 (.102)	-0.273 (.284)	-0.838** (.141)	-0.894** (.124)	-0.036 (.115)
% Women in the Labor Force	1.312** (.192)	1.360** (.166)	0.769** (.106)	0.253 (.222)	0.319 (.195)	1.221** (.194)
% Singles in the population	-0.942** (.356)	-0.866** (.309)	-0.164** (.067)	-0.040 (.201)	0.017 (.184)	-1.459** (.382)
Average Weekly Hours Worked	0.000 (.009)	0.007 (.009)	-0.110 (.366)	-0.015** (.007)	-0.012** (.005)	0.002 (.009)
Equation R^2	.3591	.5054	.3748	.9640	.9611	.4054
Adj R^2	.3311	.4838	.3474	.9541	.9526	.3552
F Value	12.809	23.359	13.701	97.500	112.887	8.077
Prob > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

A2: HETEROSKEDASTICITY AND WEIGHTING

Let the regression model at the individual level be:

(1) $$y_{ij} = \alpha + B_1 X_{ij} + u_{ij}$$

where ij denotes the ith individual in the jth SMSA and u_{ij} is homoscedastic:

(2) $$E(u_{ij}^2) = \sigma^2 , E(u_{ij}) = 0$$

Now

(3) $$\sum_{i=1}^{n} y_{ij} / n_j = \alpha + B \sum_{i=1}^{n} x_{ij} / n_j + \sum_{i=1}^{n} u_{ij} / n_j$$

where n_j = the number of people in the jth SMSA

Rewrite (3) as

(4) $$\bar{y}_j = \alpha + B \bar{x}_j + \bar{u}_j$$

$$E(\bar{u}_j^2) = \text{var} [\Sigma u_{ij} / n_j]$$

$$E(\bar{u}_j^2) = \frac{1}{n_j^2} \Sigma \text{ var } (u_{ij})$$

$$E(\bar{u}_j^2) = \frac{1}{n_j^2} n_j \sigma^2$$

(5) $$E(\bar{u}_j^2) = \frac{\sigma^2}{n_j}$$

Thus to restore heteroscedasticity, multiply (4) by $\sqrt{n_j}$

(6) $$\sqrt{n_j} \bar{y}_j = \alpha \sqrt{n_j} + B \sqrt{n_j} \bar{x}_j + \bar{u}_j \sqrt{n_j}$$

$$V_j = \sqrt{n_j} \bar{u}_j$$

$$\text{var } (V_j) = n_j \text{ var } \bar{u}_j$$

$$\text{var } (V_j) = n_j \frac{\sigma^2}{n_j}$$

$$\text{var } (V_j) = \sigma^2$$

APPENDIX

Note: Equation (6) is a weighted regression weighted by $\sqrt{n_j}$, the square root of the population of SMSA j. This regression is forced through the origin.

Furthermore, we can rewrite (3):

$$\bar{Y}_j = a + B\,\bar{X}_j + \bar{u}_j$$

Letting lower case letters denote deviations from sample means, the unweighted regression coefficient is:

$$b = \sum_{j=1}^{r} \bar{x}_j\,\bar{y}_j \;/\; \Sigma\,\bar{x}_j^{2}$$

where there are a total of r SMSA's and

$$\bar{x}_j = \bar{X}_j - \bar{X}\,, \quad \bar{y}_j = \bar{Y}_j - \bar{Y}$$

$$\bar{X} = \sum_{j=1}^{r} \bar{X}_j \;/\; r\,, \quad \bar{Y} = \sum_{j=1}^{r} \bar{Y}_j \;/\; r$$

And likewise the weighted b (b_w) is:

$$b_w = \Sigma\, n_j\,\bar{x}_{jw}\,\bar{y}_{jw} \;/\; \Sigma\, n_j\,\bar{x}_{jw}^{2}$$

$$\bar{x}_{jw} = \bar{X}_j - \bar{X}_w\,, \quad \bar{y}_{jw} = \bar{Y}_j - \bar{Y}_w$$

So:

$$\bar{X}_w = \sum_{j=1}^{r} n_j\,\bar{x}_j \;/\; \sum_{j=1}^{r} n_j$$

$$\bar{Y}_w = \sum_{j=1}^{r} n_j\,\bar{Y}_j \;/\; \sum_{j=1}^{r} n_j$$

A3: ENDOGENEITY OF THE LABOR FORCE PARTICIPATION RATE

Consider the model:

(1) $q = \alpha_0 + \alpha_1 w + \text{other variables}$

q = quantity of food consumed away from home,
w = female wage

Suppose

(2) $LFPR = B_0 + B_1 w + u$

w is not observed; solve (2) for w:

(3) $w = -\frac{B_0}{B_1} - \frac{1}{B_1} u + \frac{1}{B_1} LFPR$

substitute (3) into (1)

(4) $q = \alpha_0 - \alpha_1 \frac{B_0}{B_1} + \frac{\alpha_1}{B_1} LFPR - \frac{\alpha_1}{B_1} u$

From (2) we know $\text{cov}(u, LFPR) = \sigma^2$

if $v = \frac{-\alpha}{B_1} u$,

$\text{cov}(v, LFPR) = \frac{-\alpha}{B_1} \sigma^2$

So the Labor Force Participation Rate (LPFR) is correlated with the disturbance term in (3)

A4: MULTICOLLINEARITY ANALYSIS

Collinearity Diagnostics

Number	Eigenvalue	Condition Number	Var Prop INTERCEP	Var Prop CCPIA	Var Prop CCPIH	Var Prop WWG
1	7.94792	1.00000	0.0000	0.0001	0.0000	0.0001
2	0.02235	18.85837	0.0000	0.0000	0.0000	0.1238
3	0.01362	24.15831	0.0000	0.0086	0.0029	0.1522
4	0.00865	30.31578	0.0003	0.2840	0.0224	0.1826
5	0.00477	40.83157	0.0036	0.5488	0.1825	0.1334
6	0.00160	70.49971	0.0121	0.1576	0.4520	0.2342
7	0.0007918	100.18592	0.0376	0.0008	0.0293	0.1218
8	0.0003079	160.67477	0.9464	0.0000	0.3108	0.0518

Number	Var Prop FS	Var Prop WM	Var Prop NSNG	Var Prop HRS
1	0.0000	0.0001	0.0003	0.0000
2	0.0003	0.0000	0.5205	0.0006
3	0.0000	0.3689	0.1624	0.0000
4	0.0044	0.2110	0.1635	0.0000
5	0.0128	0.0009	0.0702	0.0000
6	0.1631	0.2711	0.0003	0.1196
7	0.7712	0.0837	0.0248	0.3298
8	0.0482	0.0642	0.0581	0.5499

APPENDIX

A5: CORRELATION OF ESTIMATES

CORRB	INTERCEP	CCPIA	CCPIH	WWG
INTERCEP	1.0000	-0.0818	-0.5555	0.0706
CCPIA	-0.0818	1.0000	0.0190	0.2067
CCPIH	-0.5555	0.0190	1.0000	-0.0587
WWG	0.0706	0.2067	-0.0587	1.0000
FS	-0.3315	-0.1847	-0.2412	-0.0026
WM	-0.3654	0.0486	0.3272	0.2637
NSNG	-0.2951	-0.0406	-0.0352	0.1817
HRS	-0.5716	-0.1611	0.2813	-0.5309

CORRB	FS	WM	NSNG	HRS
INTERCEP	-0.3315	-0.3654	-0.2951	-0.5716
CCPIA	-0.1847	0.0486	-0.0406	-0.1611
CCPIH	-0.2412	0.3272	-0.0352	0.2813
WWG	-0.0026	0.2637	0.1817	-0.5309
FS	1.0000	0.0666	0.1140	-0.2009
WM	0.0666	1.0000	0.0694	-0.1539
NSNG	0.1140	0.0694	1.0000	0.0619
HRS	-0.2009	-0.1539	0.0619	1.0000

A6: PLOT OF SQUARED RESIDUAL AND PREDICTED Y

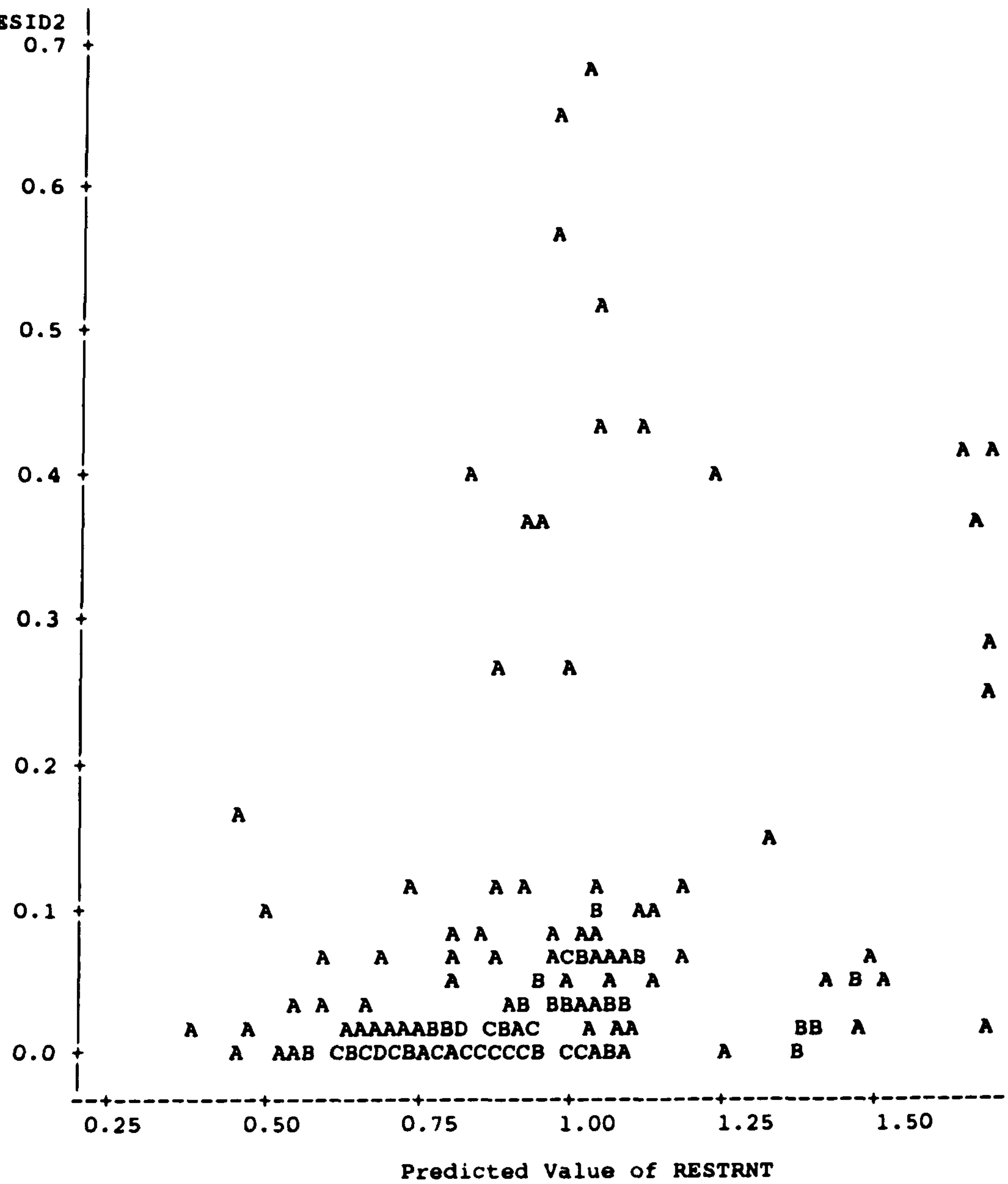
FOOD AWAY FROM HOME

```
        Scatter Plot of Squared Residual versus Predicted Y value
        Legend: A = 1 obs, B = 2 obs, etc.

RESID2 |
   2.5 +
       |
       |
       |
       |
       |
       |                               A
   2.0 +                             A   A
       |                                      A
       |                               A
       |                             A
       |
       |
       |                               A
   1.5 +
       |
       |
       |
       |
       |
       |                           A
   1.0 +                                                   AA
       |                                                     A
       |
       |                           A
       |
       |                             A                       A
       |                                                      A
   0.5 +                          A
       |
       |                        A    A   A AA
       |                               A       A
       |       A              A C BBAAAAA AAAA
       |                    AA AA AA AA   A B         B
       |         A AA      B CADBDABACC AAA        BA B A
   0.0 +      AAB A C CEBCDBEECDFED EA A  AAB   A BAA          A
       |
        ---+------------+------------+------------+------------+-------
          1.0          1.5          2.0          2.5          3.0

                        Predicted Value of FDAWAY
```

A6: PLOT OF SQUARED RESIDUAL AND PREDICTED Y

RESTAURANT

Scatter Plot of Squared Residuals versus Predicted Y Value
Legend: A = 1 obs, B = 2 obs, etc.



APPENDIX

A6: PLOT OF SQUARED RESIDUAL AND PREDICTED Y

FAST FOOD

```
Scatter Plot of Squared Residual versus Predicted Y value
Legend: A = 1 obs, B = 2 obs, etc.

RESID2 |
  0.25 +
       |
       |                                     A
       |
       |
       |                                        A
       |                           A
  0.20 +
       |                                      A
       |
       |
       |
       |
       |
  0.15 +
       |
       |
       |
       |                                   A
       |
       |
  0.10 +
       |
       |
       |                                                A
       |                                      A
       |                                       A  A
       |                          A                     A
  0.05 +                                       AA
       |                        A                  A
       |                         A  A     AB     A    A
       |                    A          A A A    A    A
       |                                  A A A    A   A  A        A
       |              AB  A       A A A   ABA B    B A  AA   A A
       |            AC   B      A  AAA BAAAAB C  AABCA BAAAB   A  A
  0.00 +   AA BA AAA  ABBAA ABACCACCAEAAACBBDAAA ACCAD AAB AA  B
       |
        ---+-----------+-----------+-----------+-----------+-------
          0.4         0.5         0.6         0.7         0.8         0.9

                           Predicted Value of FASTFD
```

A7: DURBIN-WATSON TEST FOR AUTOCORRELATION

AREAS		D-STATISTIC
1.	Durbin-Watson D:	2.843 ***
2.	Durbin-Watson D:	2.474
3.	Durbin-Watson D:	2.182
4.	Durbin-Watson D:	2.931 ***
5.	Durbin-Watson D:	2.916 ***
6.	Durbin-Watson D:	2.606
7.	Durbin-Watson D:	2.652
8.	Durbin-Watson D:	3.231 ***
9.	Durbin-Watson D:	2.631
10.	Durbin-Watson D:	3.019 ***
11.	Durbin-Watson D:	2.760
12.	Durbin-Watson D:	2.483
13.	Durbin-Watson D:	2.202
14.	Durbin-Watson D:	2.651
15.	Durbin-Watson D:	3.402 ***
16.	Durbin-Watson D:	2.691
17.	Durbin-Watson D:	2.758
18.	Durbin-Watson D:	2.044
19.	Durbin-Watson D:	3.269 ***
20.	Durbin-Watson D:	2.383
21.	Durbin-Watson D:	3.585 ***
22.	Durbin-Watson D:	3.660 ***
23.	Durbin-Watson D:	2.176
24.	Durbin-Watson D:	2.223

1. The lower bound is .2243 and upper bound is 2.822 for five variables at a five percent significance level

2. *** signifies autocorrelation according to a failure of the durbin-watson test at the five percent significance level

A8: DICKEY-FULLER TEST FOR UNIT ROOTS

The Dickey-Fuller Test for Unit Roots involves a single variable regression of the difference of a variable on its lagged value. If the coefficient is significant when you compare the t-statistic to the Dickey-Fuller table, then you have a unit root in that variable.

Formally, we test the equation:

(1) $$D\ Y_t = \alpha + B\ Y_{t-1} + e$$

for the hypothesis that B = 0 by examining the t-statistic for significance. A complete Dickey-Fuller test of all variables in the twenty-four time series subsets follows. Results of the analysis indicate evidence of a unit root for less than five percent of all cases.

A8: DICKEY-FULLER TEST FOR UNIT ROOTS

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
AREA 01					
INTERCEP	1	1.265313	0.78631738	1.609	0.1829
LGFDAWAY	1	-0.713913	0.42322773	-1.687	0.1669
LRESTRNT	1	-0.730857	0.52421244	-1.394	0.2357
LFASTFD	1	-0.690578	0.48107744	-1.435	0.2245
LCCPIA	1	0.340114	1.65821679	0.205	0.8475
LCCPIH	1	-0.056505	0.68828888	-0.082	0.9385
LWWG	1	-0.136244	0.33347287	-0.409	0.7038
LNSNG	1	-0.858609	0.92317203	-0.930	0.4050
LWM	1	0.023758	0.19358688	0.123	0.9082
LFS	1	0.323077	0.78007737	0.414	0.7000
LHRS	1	-0.267918	0.31835345	-0.842	0.4474
AREA 02					
INTERCEP	1	0.895097	0.65416133	1.368	0.2430
LGFDAWAY	1	-0.515205	0.36085166	-1.428	0.2265
LRESTRNT	1	-0.148865	0.20459206	-0.728	0.5072
LFASTFD	1	-0.449841	0.38628476	-1.165	0.3089
LCCPIA	1	-0.490918	0.34210182	-1.435	0.2246
LCCPIH	1	-0.547428	0.48502970	-1.129	0.3222
LWWG	1	0.180894	0.26563193	0.681	0.5333
LNSNG	1	-0.514151	0.21552256	-2.386	0.0755
LWM	1	-0.149092	0.33213498	-0.449	0.6768
LFS	1	-0.134454	0.18626924	-0.722	0.5103
LHRS	1	0.015920	0.39333520	0.040	0.9697
AREA 03					
INTERCEP	1	1.627663	1.04190560	1.562	0.1933
LGFDAWAY	1	-0.797987	0.50778004	-1.572	0.1912
LRESTRNT	1	-0.914639	0.51862258	-1.764	0.1526
LFASTFD	1	-0.659986	0.46344846	-1.424	0.2275
LCCPIA	1	-0.178129	0.32890733	-0.542	0.6169
LCCPIH	1	0.056382	0.27768632	0.203	0.8490
LWWG	1	-0.278553	0.57574372	-0.484	0.6538
LNSNG	1	-0.741182	0.30965183	-2.394	0.0749
LWM	1	-0.695536	0.51542668	-1.349	0.2485
LFS	1	-0.800000	0.30000000	-2.667	0.0560
LHRS	1	-0.530000	0.28145949	-1.883	0.1328
AREA 04					
INTERCEP	1	0.457525	0.67432416	0.678	0.5347
LGFDAWAY	1	-0.293441	0.39171921	-0.749	0.4954
LRESTRNT	1	-0.054954	0.38973398	-0.141	0.8947
LFASTFD	1	-1.325389	0.47055160	-2.817	0.0480
LCCPIA	1	-0.208139	0.25544396	-0.815	0.4609
LCCPIH	1	0.211543	0.37730677	0.561	0.6049
LWWG	1	-0.069134	0.28151868	-0.246	0.8181
LNSNG	1	1.407179	0.52443457	2.683	0.0550
LWM	1	-0.672277	0.42675780	-1.575	0.1903
LFS	1	-0.611111	0.54362183	-1.124	0.3238
LHRS	1	-0.710526	0.47859299	-1.485	0.2118
AREA 05					
INTERCEP	1	0.184235	0.46924071	0.393	0.7146
LGFDAWAY	1	-0.152438	0.35352969	-0.431	0.6886
LRESTRNT	1	-0.651703	0.58334791	-1.117	0.3265

LFASTFD	1	-0.507625	0.54107151	-0.938	0.4013
LCCPIA	1	-0.521535	0.58983862	-0.884	0.4265
LCCPIH	1	0.143474	0.21370913	0.671	0.5388
LWWG	1	-0.634356	0.46155824	-1.374	0.2413
LNSNG	1	-0.944851	0.50916902	-1.856	0.1371
LWM	1	-0.112245	0.51708258	-0.217	0.8388
LFS	1	0.017456	0.15963996	0.109	0.9182
LHRS	1	-0.686801	0.39204819	-1.752	0.1547
AREA 06					
INTERCEP	1	1.879564	0.85791891	2.191	0.0936
LGFDAWAY	1	-1.189060	0.53865569	-2.207	0.0919
LRESTRNT	1	-0.279559	0.53461866	-0.523	0.6287
LFASTFD	1	-1.413543	0.44319565	-3.189	0.0332
LCCPIA	1	-0.281026	0.28384322	-0.990	0.3782
LCCPIH	1	0.492895	0.78395897	0.629	0.5636
LWWG	1	-0.706542	0.16923570	-4.175	0.0140
LNSNG	1	-0.604432	0.89671357	-0.674	0.5372
LWM	1	-1.590164	0.46387577	-3.428	0.0266
LFS	1	-0.342857	0.34729274	-0.987	0.3794
LHRS	1	-0.398131	0.31040984	-1.283	0.2689
AREA 07					
INTERCEP	1	-0.958637	0.77427676	-1.238	0.2834
LGFDAWAY	1	0.303289	0.28835908	1.052	0.3522
LRESTRNT	1	0.106514	0.48408919	0.220	0.8366
LFASTFD	1	-0.042988	0.60956586	-0.071	0.9472
LCCPIA	1	-0.257325	0.25470239	-1.010	0.3695
LCCPIH	1	0.318225	0.27431862	1.160	0.3105
LWWG	1	-0.053093	0.13628296	-0.390	0.7167
LNSNG	1	0.023470	0.27705576	0.085	0.9366
LWM	1	0.018705	0.31879914	0.059	0.9560
LFS	1	0.040000	0.09797959	0.408	0.7040
LHRS	1	-0.582589	0.40672650	-1.432	0.2253
AREA 08					
LGFDAWAY	1	-0.688025	0.44371033	-1.551	0.1959
LRESTRNT	1	-0.427294	0.41934670	-1.019	0.3658
LFASTFD	1	-1.118891	0.50395767	-2.220	0.0906
LCCPIA	1	-0.453002	0.35853544	-1.263	0.2750
LCCPIH	1	0.137539	0.81634861	0.168	0.8744
LWWG	1	-0.195326	0.30247445	-0.646	0.5536
LNSNG	1	-0.025438	0.56972242	-0.045	0.9665
LWM	1	-0.136263	0.31572489	-0.432	0.6883
LFS	1	-0.055901	0.35354657	-0.158	0.8820
LHRS	1	-0.530000	0.28145949	-1.883	0.1328
AREA 09					
LGFDAWAY	1	-0.979192	0.47497616	-2.062	0.1083
LRESTRNT	1	-1.263262	0.45658336	-2.767	0.0505
LFASTFD	1	-0.849135	0.44063781	-1.927	0.1262
LCCPIA	1	-0.158099	0.23344985	-0.677	0.5354
LCCPIH	1	0.217902	0.47024522	0.463	0.6672
LWWG	1	-0.793602	0.38931252	-2.038	0.1111
LNSNG	1	-1.167339	0.25767858	-4.530	0.0106
LWM	1	-0.785423	0.43727593	-1.796	0.1469
LFS	1	0.188841	0.15943498	1.184	0.3018
LHRS	1	-0.352166	0.37150443	-0.948	0.3968
AREA 10					
LGFDAWAY	1	-1.333027	0.46890194	-2.843	0.0467
LRESTRNT	1	-1.149861	0.54911368	-2.094	0.1044
LFASTFD	1	-1.659947	0.46618753	-3.561	0.0236
LCCPIA	1	-0.488659	0.34553395	-1.414	0.2302

LCCPIH	1	-0.694524	0.81032648	-0.857	0.4397
LWWG	1	-0.117119	0.24534293	-0.477	0.6580
LNSNG	1	-0.892430	0.50922683	-1.753	0.1546
LWM	1	-1.067424	0.96667271	-1.104	0.3315
LFS	1	-0.700000	0.46142894	-1.517	0.2039
LHRS	1	-0.473412	0.39204808	-1.208	0.2937
AREA 11					
LGFDAWAY	1	-1.163799	0.31823653	-3.657	0.0216
LRESTRNT	1	-0.718199	0.46522836	-1.544	0.1975
LFASTFD	1	-0.327323	0.39990431	-0.819	0.4590
LCCPIA	1	-0.125433	0.32419854	-0.387	0.7185
LCCPIH	1	-0.505672	0.35117437	-1.440	0.2233
LWWG	1	-0.055936	0.30037229	-0.186	0.8613
LNSNG	1	-0.683799	0.42277836	-1.617	0.1811
LWM	1	-0.728181	0.43367899	-1.679	0.1684
LFS	1	-0.612903	0.30260747	-2.025	0.1128
LHRS	1	-0.530000	0.28145949	-1.883	0.1328
AREA 12					
LGFDAWAY	1	-0.694565	0.48074171	-1.445	0.2220
LRESTRNT	1	-0.501039	0.45246270	-1.107	0.3302
LFASTFD	1	-1.137911	0.49596266	-2.294	0.0835
LCCPIA	1	-0.100683	0.18665247	-0.539	0.6182
LCCPIH	1	-1.107981	0.48869061	-2.267	0.0860
LWWG	1	-0.972543	0.48946176	-1.987	0.1179
LNSNG	1	-1.071996	0.22895345	-4.682	0.0094
LWM	1	-0.321111	0.07154302	-4.488	0.0109
LFS	1	-0.276786	0.28315680	-0.977	0.3837
LHRS	1	-0.550000	0.16717185	-3.290	0.0302
AREA 13					
LGFDAWAY	1	-0.214532	0.46687059	-0.460	0.6697
LRESTRNT	1	-0.413912	0.57582510	-0.719	0.5120
LFASTFD	1	-1.533239	0.51405602	-2.983	0.0406
LCCPIA	1	-0.547188	0.38272892	-1.430	0.2260
LCCPIH	1	-0.163293	0.32077957	-0.509	0.6375
LWWG	1	0.116684	0.24297725	0.480	0.6561
LNSNG	1	-0.307688	0.36030637	-0.854	0.4413
LWM	1	-0.028225	0.15218377	-0.185	0.8619
LFS	1	-0.672566	0.34205572	-1.966	0.1207
LHRS	1	-1.000000	0.54989751	-1.819	0.1431
AREA 14					
LGFDAWAY	1	-0.214532	0.46687059	-0.460	0.6697
LRESTRNT	1	-0.413912	0.57582510	-0.719	0.5120
LFASTFD	1	-1.533239	0.51405602	-2.983	0.0406
LCCPIA	1	-0.547188	0.38272892	-1.430	0.2260
LCCPIH	1	-0.163293	0.32077957	-0.509	0.6375
LWWG	1	-0.413000	0.38492518	-1.073	0.3437
LNSNG	1	-0.307688	0.36030637	-0.854	0.4413
LWM	1	-0.028225	0.15218377	-0.185	0.8619
LFS	1	-0.672566	0.34205572	-1.966	0.1207
LHRS	1	-1.000000	0.54989751	-1.819	0.1431
AREA 15					
LGFDAWAY	1	0.069127	0.30479224	0.227	0.8317
LRESTRNT	1	0.126175	0.28249004	0.447	0.6782
LFASTFD	1	-0.476416	0.69195846	-0.689	0.5290
LCCPIA	1	-0.417799	0.30031758	-1.391	0.2366
LCCPIH	1	-0.030793	0.38399066	-0.080	0.9399
LWWG	1	-0.090785	0.24485917	-0.371	0.7296
LNSNG	1	-0.256338	0.29688939	-0.863	0.4366
LWM	1	0.091391	0.14103920	0.648	0.5523

LFS	1	-0.441176	0.19893749	-2.218	0.0908
LHRS	1	-0.789342	0.42931116	-1.839	0.1398
AREA 16					
LGFDAWAY	1	-0.889159	0.47666999	-1.865	0.1356
LRESTRNT	1	-1.671472	0.42207191	-3.960	0.0167
LFASTFD	1	-0.742580	0.48288364	-1.538	0.1989
LCCPIA	1	-0.519225	0.42620738	-1.218	0.2901
LCCPIH	1	-0.566532	0.50389146	-1.124	0.3238
LWWG	1	-0.474314	0.34509497	-1.374	0.2413
LNSNG	1	-1.000211	0.55312488	-1.808	0.1448
LWM	1	-0.925241	0.34360052	-2.693	0.0545
LFS	1	-1.363636	0.44709808	-3.050	0.0380
LHRS	1	-0.473862	0.39165239	-1.210	0.2929
AREA 17					
LGFDAWAY	1	-0.882235	0.46248163	-1.908	0.1291
LRESTRNT	1	-0.934797	0.50450248	-1.853	0.1375
LFASTFD	1	-0.306302	0.38970472	-0.786	0.4758
LCCPIA	1	-0.327776	0.29784645	-1.100	0.3329
LCCPIH	1	-0.471882	0.83072562	-0.568	0.6004
LWWG	1	-0.679029	0.47883391	-1.418	0.2291
LNSNG	1	-0.593475	0.45091610	-1.316	0.2585
LWM	1	-0.695000	0.34966353	-1.988	0.1178
LFS	1	-0.029197	0.31933785	-0.091	0.9315
LHRS	1	-0.530797	0.32448150	-1.636	0.1772
AREA 18					
LGFDAWAY	1	-0.630963	0.70843208	-0.891	0.4234
LRESTRNT	1	-0.300171	0.68895235	-0.436	0.6855
LCCPIA	1	-0.221414	0.23659263	-0.936	0.4023
LCCPIH	1	-0.154909	0.58287125	-0.266	0.8036
LWWG	1	-0.978181	0.46986387	-2.082	0.1058
LNSNG	1	1.263680	1.19871990	1.054	0.3513
LWM	1	0.029970	0.37976018	0.079	0.9409
LFS	1	-0.937500	0.51190260	-1.831	0.1410
LHRS	1	-0.549029	0.43540153	-1.261	0.2759
AREA 19					
LGFDAWAY	1	-0.051723	0.37010146	-0.140	0.8956
LRESTRNT	1	0.051491	0.33844360	0.152	0.8864
LFASTFD	1	-1.362409	0.33802757	-4.030	0.0157
LCCPIA	1	-1.292685	0.49513660	-2.611	0.0594
LCCPIH	1	-0.824000	0.41935841	-1.965	0.1209
LWWG	1	-0.212515	0.40765259	-0.521	0.6297
LNSNG	1	-0.228213	1.02359331	-0.223	0.8345
LWM	1	-0.083710	0.23411371	-0.358	0.7387
LFS	1	-1.224000	0.51716148	-2.367	0.0771
LHRS	1	-1.239789	0.48541257	-2.554	0.0630
AREA 20					
LGFDAWAY	1	-0.895805	0.46438850	-1.929	0.1260
LRESTRNT	1	-0.888851	0.45093518	-1.971	0.1200
LFASTFD	1	-0.755681	0.40273977	-1.876	0.1338
LCCPIA	1	-0.510388	0.43289456	-1.179	0.3037
LCCPIH	1	-0.379136	0.58196247	-0.651	0.5503
LWWG	1	-0.231480	0.37258204	-0.621	0.5681
LNSNG	1	-1.301477	0.48733514	-2.671	0.0558
LFS	1	-0.518868	0.45547576	-1.139	0.3182
LHRS	1	-0.508824	0.46964750	-1.083	0.3396
AREA 21					
LGFDAWAY	1	-0.895805	0.46438850	-1.929	0.1260
LRESTRNT	1	-0.888851	0.45093518	-1.971	0.1200

LFASTFD	1	-0.755681	0.40273977	-1.876	0.1338
LCCPIA	1	-0.510388	0.43289456	-1.179	0.3037
LCCPIH	1	-0.379136	0.58196247	-0.651	0.5503
LWWG	1	-0.594341	0.48469136	-1.226	0.2874
LNSNG	1	-1.301477	0.48733514	-2.671	0.0558
LWM	1	-0.334068	0.22041892	-1.516	0.2042
LFS	1	-0.518868	0.45547576	-1.139	0.3182
LHRS	1	-0.508824	0.46964750	-1.083	0.3396
AREA 22					
LGFDAWAY	1	-0.700931	0.27166955	-2.580	0.0613
LRESTRNT	1	-0.518277	0.27507137	-1.884	0.1326
LFASTFD	1	-0.960635	0.35645600	-2.695	0.0544
LCCPIA	1	-1.381914	0.72592747	-1.904	0.1297
LCCPIH	1	-1.057951	0.83947449	-1.260	0.2761
LWWG	1	-0.527527	0.56220863	-0.938	0.4012
LNSNG	1	-1.077842	0.39471093	-2.731	0.0524
LWM	1	-0.507287	0.59655103	-0.850	0.4430
LFS	1	-0.584746	0.37859168	-1.545	0.1973
LHRS	1	-0.118987	0.29490139	-0.403	0.7072
AREA 23					
LGFDAWAY	1	0.068059	0.31659261	0.215	0.8403
LRESTRNT	1	-0.083532	0.49723594	-0.168	0.8747
LFASTFD	1	-0.038540	0.40401962	-0.095	0.9286
LCCPIA	1	-0.378762	0.31421379	-1.205	0.2945
LCCPIH	1	-0.383795	0.55456118	-0.692	0.5270
LWWG	1	-0.597967	0.46471424	-1.287	0.2676
LNSNG	1	-1.421760	0.62429455	-2.277	0.0850
LWM	1	-0.300616	0.36918602	-0.814	0.4612
LFS	1	0.166667	0.09860133	1.690	0.1662
LHRS	1	-0.666036	0.38793380	-1.717	0.1611
AREA 24					
LGFDAWAY	1	0.958054	0.31702540	3.022	0.0391
LRESTRNT	1	0.817831	0.36057019	2.268	0.0859
LFASTFD	1	-1.215538	0.49000550	-2.481	0.0682
LCCPIA	1	0.056598	0.25922644	0.218	0.8379
LCCPIH	1	0.249694	0.32169593	0.776	0.4810
LWWG	1	-1.290798	0.63161121	-2.044	0.1105
LNSNG	1	0.066206	3.80778272	0.017	0.9870
LWM	1	0.730016	1.58282487	0.461	0.6686
LFS	1	-0.750000	2.55664983	-0.293	0.7838
LHRS	1	-0.530000	0.28145949	-1.883	0.1328

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