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### Market Trends in Food Consumption Expenditures Away From Home Prior to the COVID-19 Pandemic

Rebecca Weir

Minnesota State University Moorhead, [rebecca.weir2016@icloud.com](mailto:rebecca.weir2016@icloud.com)

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# Market Trends in Food Consumption Expenditures Away From Home Prior to the COVID-19 Pandemic

## Abstract

U.S. food consumption expenditures away from home increased from 19 percent of total food expenditures in 1955 to 48 percent in 2015. Simultaneously, female participation in the labor force grew by 52.7 million women from 35 to 57 percent, signifying increased opportunity cost for women to prepare meals at home. This research uses an ordinary least squares regression to examine socioeconomic factors influencing the rise in U.S. food consumption expenditures away from home in 2018. Results inform food production and service industries' marketing strategies, and set the stage for whether a new pattern emerges in response to the COVID-19 pandemic.

## Keywords

food, food expenditures, food away from home, U.S. food consumption

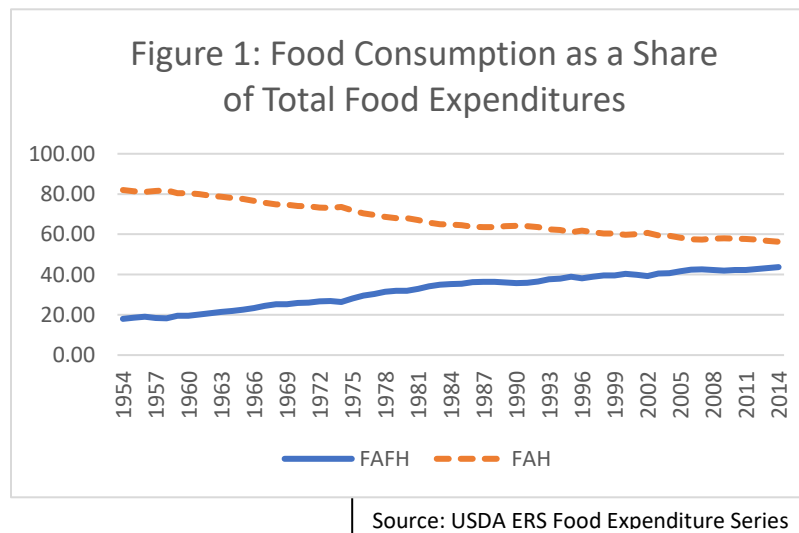
## Cover Page Footnote

I would like to thank Dr. Tonya Hansen for her valuable assistance on this paper.

## I. Introduction

Changes in communication, transportation, and food consumption patterns represent some of the most sweeping transformations in American family lifestyles over the last half century. Historically, families gathered at tables in their homes to share a meal and conversation. In contrast, the twenty-first century American family shuttled to activities with cell phone in hand and grew accustomed to eating meals on the move or picking up restaurant meals to take home at the end of a busy day. This research explores this phenomenon by analyzing the American food consumer's changing consumption patterns.

Food consumption includes two categories: *food at home* and *food away from home*. These categories differ by where the food is prepared and the level of control a consumer has over the food's nutritional content. *Food at home* includes food purchased at a grocery store, convenience store, or supermarket to be consumed in the home. In contrast, *food away from home* is food purchased at either a fast food or full-service restaurant. As total expenditures of one category increase, total expenditures of the other category decrease. Figure 1 displays the share of total food expenditures from 1954-2014, categorized as food at home (FAH) and food away from home (FAFH).



Food consumption away from home has been rising over the last 50 years with regard to expenditures *and* its share of total food consumption. U.S. food consumption expenditures away from home have risen from 19 percent of total food consumption in 1955 to 48 percent in 2015 (USDA). As shown in Figure 1, food at home comprised a large majority of food expenditures in years past, but experienced a noticeable downward trend through 2014. This trend stems from a multitude of demand-related factors. The U.S. is constantly changing in terms of

demographics and socioeconomic factors. Higher opportunity costs, declining household size, and ease of access explain why food at home expenditures decreased compared to food away from home.

Both female labor force participation and household size have changed in recent years which further contribute to changes in food expenditures away from home. In past generations, men were the primary wage earners, and females cared for the home and children. Today, these roles are shared. From 1955 to 2015, female labor force participation has increased by 52.7 million from 35 to 57 percent (BLS), implying that the opportunity cost for women to make meals is increasing. Household size also impacts food away from home expenditures. Economies of scale play a factor in one's decision to purchase food away from home. If a household has many members, it realizes economic gains by purchasing groceries in bulk. Both Costco and Sam's Club have increased in popularity due to their supply of bulk items. In addition to the monetary savings achieved by purchasing in bulk, it requires less household labor time per person to produce a meal for a larger group or family. Namely, the opportunity cost per person of making a meal decreases with each person added to the table.

Simultaneously, many changes have also occurred on the supply side within the food industry itself. McDonald's launched drive-thru service in 1975. While this convenience option remains increasingly popular, additional takeout and delivery (Doordash, Uber Eats, etc.) services have emerged. For those that prefer to prepare food at home, grocery shopping has become more convenient with the addition of online shopping and pick up options. The Hello Fresh and Blue Apron companies provide premeasured ingredients, limiting the time the consumer allocates to food preparation and decreasing the time from preparation to dining. The food industry's many innovations complement Americans' busy lives by offering drive-thru service, delivery service, or selling products that increase household efficiency.

Some ambiguity exists related to food consumption away from home. The NDP Group, formerly known as the National Purchase Diary Panel, Inc., conducts market research in the U.S. An NDP Group report released in July 2018 states that U.S. consumers increasingly eat and prepare their meals at home. Their result contradicts recent news reports that households consume more at restaurants based on an uptick in food service spending. Through their research, the NDP Group finds that four out of five meals *are* prepared at home. They note that food service *spending* has increased, but that food service *visits* have flattened compared to 2017. The NDP Group views visits as a better indicator of food service growth than spending because the cost of a restaurant meal is increasing faster than a home cooked meal, and a home cooked meal already costs just one-third the price of a restaurant meal. David Portalatin, an NDP Food Industry Advisor, attributes the

high expenditure level of food at home to a changing workforce, the ease of online shopping, and the boom in streaming entertainment that gives consumers fewer reasons to leave the home. While food expenditures away from home are rising, the number of meals consumed away from home are not (NPD Group, 2014).

The purpose of this paper is to examine socioeconomic factors influencing the rise in food consumption expenditures away from home in the U.S. in 2018. Results can benefit those in food production and service industries interested in better positioning themselves to market their products to a changing U.S. consumer. Continuation of this research post COVID-19 will highlight whether the food service industry has been disrupted permanently or if it can regain its pre-pandemic momentum in relation to food consumption expenditures away from home.

Previous studies have not considered the effects of building permits, average travel time to work, incoming flights or people telecommuting on food consumption expenditures away from home, and this research seeks to fill this void. The next section provides a review of existing literature followed by the theoretical framework, data and methods, results, and concluding remarks.

## **II. Literature Review**

Previous literature focuses on three major areas: demographic considerations, economic considerations, and household considerations. I conclude the literature review by highlighting factors unconsidered previously, but examined within this research.

### *Demographic Considerations*

Several studies examine the effects of socioeconomic changes on food consumption expenditures away from home. The United States has experienced rapid changes (improvements in educational access, growth in female labor force participation, urbanization, income growth) leading to modifications in food away from home expenditures. These sociodemographic changes occur simultaneously with increases in food expenditures away from home.

Blisard, et al. (2002) note that the U.S. is wealthier, older, more educated, and more diverse. It is assumed that as one enters new demographic groups, the individual immediately adopts the consumption characteristics of the new group. A summary of group behaviors relative to each subcategory follows.

**Income & Age** Younger and older people reveal different food tastes and preferences, eating habits, lifestyles, and socialization patterns (Lee & Tan, 2006). Income positively impacts food consumption expenditures away from home, meaning as income rises, food expenditures away from home rise too (Binkley, et al., 1997; McCracken and Brandt, 1987; Prochaska and Schrimper, 1973; Blick, et

al., 2018; Mottaleb, et al., 2017). Binkley (2005) and Stewart, et al. (2004) find that income plays a larger role at table service restaurants than fast food restaurants. In terms of the age spectrum, food away from home declines after middle age (Nayga and Capps, 1992) and older people do not eat outside the home as much as younger people (Blisard, et al., 2002). The decline in food consumption away from home by older Americans offsets some of the dramatic increase in food expenditures away from home.

**Education** Binkley et al. (1997), Binkley (2005), Stewart, et al. (2004), and Blisard, et al. (2002) consider education in their respective models, but report different results. The inconsistencies occur because of income and health awareness effects. On average, individuals with greater levels of education earn more income which increases food consumption expenditures. On the other hand, food away from home expenditures decrease because these individuals elicit a higher health awareness. Binkley (2005) and Stewart, et al. (2004) find higher education results in more table service expenditures compared to fast food expenditures. This relates to more educated people demanding more leisure. The overall impact of education on food expenditures away from home depends on which competing force (income or health) is stronger.

**Diversity** The U.S. is very diverse both racially and ethnically; however, the food service industry lags in its response to this trend. Many U.S. restaurants tailor menu items to white Americans' tastes and preferences. Limited options exist for those wanting to consume Asian or ethnically diverse food. White-headed households have the highest probability of purchasing food away from home. The lower availability of ethnic foods in commercial eating establishments causes blacks and Asians to consume less food away from home (Blick, et al., 2018).

### *Economic Considerations*

Opportunity cost also impacts food expenditures away from home because an individual experiences both monetary and time costs when deciding whether to consume food at home or away from home. Female labor force participation has displayed significant increases in recent decades; nearly 60% of women participate in the labor force in 2019 (St. Louis Fed). Time spent planning meals, shopping for groceries, and preparing meals is a larger monetary sacrifice for current U.S. female labor force participants than past generations, implying that the opportunity cost for women to make meals is increasing. Nayga and Capps (1992) report that the share of total expenditure going to food away from home increases as the labor force participation rate of women increases. As the economic value of women's time increases, many women elect to work more hours in formal labor markets and consume food away from home rather than allocating their time in the household production task of cooking. Prochaska and Schrimper (1973) include the

homemaker's employment to account for opportunity cost which they report to be positively related to food expenditures away from home. Binkley (2005) measures the cost of time by including the average hours per week worked by the respondent in the survey. Additionally, the availability and proximity of restaurants impacts time costs (Binkley et al., 1997). An increase in the number of establishments decreases search costs. Therefore, someone living in close proximity to a restaurant will likely consume higher rates of food away from home than someone living a greater distance.

### *Household Considerations*

Many previous studies consider size and composition of the household. Authors highlight the economies of scale present within a larger household. Despite Binkley (2005) and Lee and Tan (2006) not finding household size to be significant, others discover a negative relationship between household size and food away from home expenditures (McCracken and Brandt, 1987; Blick, et al., 2018). Interestingly, household size positively influences the decision to consume food away from home in Bangladesh. However, upon deciding to consume, household size negatively impacts food away from home expenditures (Mottaleb, et al., 2017). Stewart, et al. (2004) consider four categories related to household size: single person, single parent, traditional family, and multiple adults without children. Prochaska and Schrimper (1973) take a different approach and break children into age groupings. They discover the presence of a preschool-aged child has a strong negative effect on food expenditures away from home while the presence of a school-aged child varies within the different age segments.

### *Previously Unconsidered Factors*

While many previous studies examine food expenditures away from home, these studies do not exhaust all independent variables that could be considered in relation to societal trends. Namely, previous literature does not assess average travel time to work, building permits, incoming flights, or people telecommuting. I intend to analyze the effects of these four variables on food expenditures away from home. The longer time one spends traveling to work, the less time the person has available for leisure. It becomes convenient to stop by a fast food restaurant or order take-out on the commute home, especially since one is already in the car and not making a special trip. Therefore, I hypothesize that as the travel time to work increases, one will consume more food away from home. I use building permits as a measure of the overall economy. A high number of building permits suggests that the economy is expanding, and consumer confidence is high. Therefore, I expect restaurant expenditures to increase when building permits increase. Incoming flights measure tourism. When traveling, whether on a business trip or vacation, consumers typically purchase food from restaurants. Therefore, as the number of

flights coming into a state increases, I anticipate food expenditures away from home will also increase. Lastly, I consider people telecommuting. This relates to the article by the NPD Group. It is likely that a higher level of telecommuting will be sustained after the COVID-19 pandemic resides because workers forced to work from home during much of this time adapted. When working from home, consumers incur less motivation to leave the home to obtain a restaurant meal. Therefore, I hypothesize that as the number of people telecommuting increases, food expenditures away from home will decrease. The next section considers the underlying theory relating to consumer choice behavior.

### III. Theoretical Framework

Becker (1965) introduced the classic household production theory. He assumed households are both producers and consumers and face constraints in each of these roles. A consumer's goal is to maximize utility subject to a budget constraint while a producer's goal is to maximize profits subject to resource constraints. The allocation and efficiency of leisure time gains increasing importance to economic welfare because the traditional number of work week hours has been declining with ongoing economic development. Becker's theory highlights that the value of time is not necessarily equal. One of his concerns is that the cost of time declines on weekends and evenings due to more firms being closed during these hours. However, current businesses are commonly open on both nights and weekends; therefore, time cost does not decline because much of society engages in work seven days per week. Non-household production did not take place on Sunday for many in past generations, whereas today's restaurants experience their highest sales on the weekends. It is important to note these societal changes given that Becker's article was written 55 years ago. The choice between consuming food at home and food away from home depends on *both* an individual's monetary and an individual's time constraints.

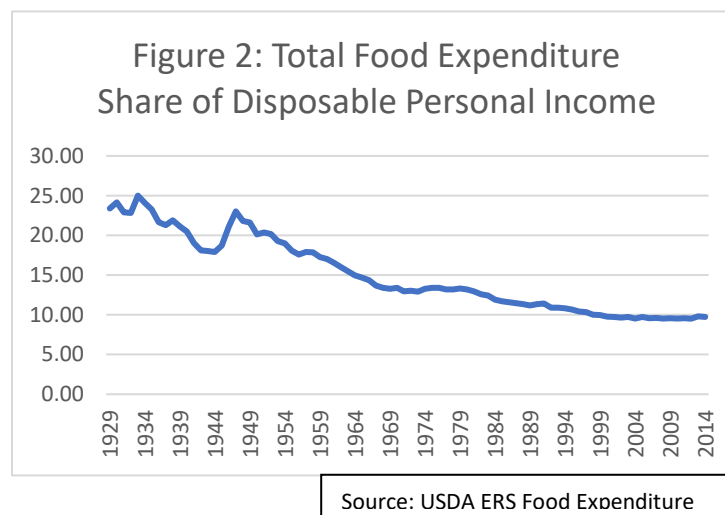
When considering the trade-off between food at home and food away from home, both direct and indirect costs require consideration. People often disregard the total time that contributes to food at home consumption which includes time spent grocery shopping, preparing the meal, cooking it, and cleaning up after consuming. The exact factors facilitating this trade-off remain unclear. Becker (1965) includes an effective example from Margret Reid (1963) examining substitution of store-bought and home-delivered milk that ties into this study on food consumption. Reid (1963) recognizes that the cost of inputs into the commodity "milk consumption at home" is either the sum of the price of milk in the store and the forgone value of the time used to carry it home or simply the price of delivered milk. A reduction in the price of store milk in comparison to home-delivered milk reduces the relative price of store milk and increases the quantity demanded of this product, *ceteris paribus*. This example highlights an idea central



to this research: when accounting for convenience of goods, one must consider both prices of the product consumed *and* the consumer's value of time.

Time constraints and convenience also play a role in the increasing food consumption away from home. Time acts as a primary factor for fast food restaurants, but not table service restaurants. Generally, fast food is consumed for its convenience. On the other hand, eating at a sit-down restaurant often requires the same amount of time as making, eating, and cleaning up food at home. Therefore, people electing to eat at these restaurants prefer leisure time (Lee & Tan, 2006). These consumers trade labor for leisure and exhibit less concern with their time constraints.

Correspondingly, household income represents another primary factor impacting food consumption expenditures. As income rises, people consume more food away from home, *ceteris paribus*, as this action serves as a leisure activity for the household. Among U.S. households, consumers spend a smaller percentage of disposable income on food than in years past. Figure 2 displays the downward trend in total food expenditures as a share of disposable income.



According to Figure 2, consumers spent roughly 25 percent of their disposable income on food in 1929 while they spent roughly ten percent in 2014. However, households allocate a larger share of total food spending to food away from home in 2014. A rise in income also results in longer commutes given that housing size in terms of square feet is viewed as a normal good. Longer commutes increase costs (gas, time), so the net effect of rising income depends on which force (increasing commute transportation cost or decreasing time available) is stronger. Blisard, et al. (2002) recognize that consumers meeting nutritional needs spend extra discretionary income on quality and convenience, rather than quantity.

Race/ethnicity serves as an important demographic variable to consider. Many restaurants tailor their food offerings to those more typically consumed by a white population. Few diverse options, such as Asian food offerings, exist, prompting these citizens to consume more food at home. As the percent of whites decreases relative to blacks and Asians, food expenditures away from home are expected to decrease unless food service offerings expand in a way that is representative of the diversity of U.S. consumers.

Household size exhibits a negative impact on food consumption expenditures away from home (McCracken and Brandt, 1987; Blick, et al. 2018; Mottaleb, et al. 2017). If household size increases, it is likely that food consumption away from home decreases. Economies of scale also arise in this situation. If the household is large, it may purchase groceries in bulk, and correspondingly lowering the price per unit. Also, it is more economical for large families to cook at home considering cooking time. When making a meal for one compared to five, the incremental time needed to make enough for the extra four people is marginal, and the per-person cooking time decreases as the number of people increases. Therefore, as consistent with previous findings, I expect large families to consume less food away from home.

The likelihood of someone choosing to leave the home represents another factor to consider when examining food consumption expenditures. As stated previously, many consumers leave the house less frequently due to increased ability to work from home and entertainment being readily available at their fingertips. More than 26 million Americans, roughly 16% of the workforce, work from home in some capacity. Between 2005 and 2015, the number of U.S. employees partaking in telecommuting increased by 115% (BLS). During the COVID-19 pandemic even more of the U.S. workforce began telecommuting. Weather acts as an additional factor influencing if someone leaves the home. When extreme weather events (such as the 2019 Polar Vortex) occur, restaurant sales decrease. The NPD Group notes that January 2020 restaurant chain transactions rose roughly 2% compared to a year ago (2019). David Portalatin stated, “January is historically one of the toughest months for U.S. restaurants and bad weather is usually a contributor” (NPD Group). Nayga and Capps (1992) report that the budget share is lower in January, February, April, and September relative to the month of December (base month). This aligns with the NPD Group’s finding that in extreme weather consumers are less likely to go out to eat.

Overall, many factors including age, race, building permits, household size, education, female labor force participation, average travel time to work, income, poverty, restaurant density, incoming flights, and telecommuting influence the decision to consume food away from home. It is also likely that no single factor

triggers the response, but rather that a combination of these factors influence one's decision to consume food away from home.

#### IV. Data

Data for this study originate from the 2018 United States QuickFacts<sup>1</sup> table along with the Consumer Expenditure Survey. I measure the dependent variable, food expenditures away from home, in two different ways. Currently, food expenditure data are not available at the state level (USDA-ERS, BLS-CES). However, regional expenditure data are well documented. Regional food expenditure data are divided by each state's per capita income to obtain state-level estimates. This results in the fraction of per capita income spent on food away from home in each state. Upon further research, I discovered data from the National Restaurant Association estimating each state's food away from home expenditures in 2018. By dividing each state's estimated restaurants sales by its population, an estimate of state-level per capita restaurant sales emerges. I incorporate each dependent variable in its own regression equation to examine differences among the two alternative dependent variables and their associated independent variables. I also include the regionally-adjusted food at home for comparison.

Table 1 displays the independent variables initially used in this study and their expected signs.

<b>Table 1: Independent Variables and Expected Signs</b>	
<b>Independent Variable</b>	<b>Expected Sign</b>
% Persons 65+	(-)
% Persons Under 5	(-)
% White	(+)
Building Permits Per Sq. Mile	(+)
Household Size	(-)
% Persons w/ Bachelor's Degree	(?)
% Female LFPR	(-)
Mean Travel Time to Work	(+)
Per Capita Income	(+)
% Poverty	(-)
Restaurant Locations Per Sq. Mile	(+)
Number of Incoming Flights	(+)
People Telecommuting	(-)

Source: BLS Quickfacts Table, Exp. signs based on previous literature

Elder Americans consume less food, so I anticipate expenditures will decrease as this sub-population comprises a larger share of the total population. Building permits per square mile measures the state of the economy. If the economy experiences expansionary periods, people will be more flexible with their money. When consumer confidence is high, consumers elect to spend more disposable income. I include mean travel time to serve as another measure of opportunity cost. I suspect that as people are traveling greater distances, they will be more apt to purchase food away from home than to spend their limited time at home cooking. I also include the percent of people in poverty. People at the poverty line receive supplemental income such as SNAP which does not allow restaurant purchases. This income supplement lowers the price for food at home, making it desirable for those at the poverty line to purchase food at home. This favors an expected negative sign for this variable. More restaurant locations per square mile decreases search costs and increases access. Tourism has not been considered by previous studies. Air travel became more popular and accessible in recent decades. When on a trip, people consume more meals at restaurants given they are likely staying in hotels without the ability to cook themselves. An increase in flights coming into a state increases visitors consuming food away from home. The last variable I consider is the number of people telecommuting. If someone does not leave the house for work, it will be favorable to cook at home.

Data used in this analysis originate from multiple sources (See Appendix A) to provide a comprehensive description of food expenditures away from home. The next section highlights the method used in this research.

## **V. Methods**

Previous studies focus on the Tobit, double-hurdle, and Almost Ideal Demand System (AIDS) models. Both McCracken and Brandt (1987) and Lee and Tan (2006) use the Tobit model. While the Tobit model performs well for them, it does not suit my data. The Tobit model censors for zero expenditures which is appropriate since not all participants in their study of individuals record food away from home expenditures during the survey period. The Tobit model accounts for the presence of zero-valued observations. Altering or disposing of zero expenditure observations results in the loss of valuable information on users and non-users (Heckman, 1979). In this context, the Ordinary Least Squares (OLS) regression model results in biased, inconsistent, and inefficient parameter estimates (Greene, 2003). The Tobit model approximates both the quantity responses of households actively consuming and the participation adjustments of exit-entry households (McCracken and Brandt 1987). McCracken and Brandt (1987) criticize the OLS model, stating that its estimates would not include the market participation component and therefore would underestimate total elasticity.

Mottaleb, et al. (2017) and Blick, et al. (2018) employ the double-hurdle model (Cragg, 1971). The double-hurdle model contains two equations. The first equation determines the decision to participate in the food away from home market, and the second equation hurdle shapes the amount spent by the consumer on food away from home (Moffatt, 2005). Mottaleb, et al. (2017) state that the Tobit model is restrictive in its parameterization. The Tobit model assumes the same variables predict both the probability to choose food away from home and the food away from home expenditures incurred. In contrast, the double-hurdle model includes different sets of variables for the participation decision and expenditures incurred.

Binkley et al. (1997) employ the Almost Ideal Demand System (AIDS) model. This model allows for multiple dependent variables to be examined. Binkley et al. (1997) disaggregate food away from home for the various types of establishments. The establishments include fast food (burger, pizza, and chicken) as well as table service (expensive, midrange, and inexpensive) restaurants. The AIDS model does not align with my research objective. I analyze aggregate food expenditures away from home, rather than different subcategories of food away from home establishments.

Both the Tobit model and double-hurdle models censor for zero expenditure data from the surveys. I elect to use the OLS method since my data do not represent the behavior of individuals (and therefore have no zero-expenditure data), but rather represent state-level expenditures per capita. Prochaska and Schrimper (1973) also use the OLS method.

Equation 1 displays the general model form for an OLS regression.

$$\text{Equation 1: } Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \varepsilon_i$$

Each X-term represents an independent variable which relates to  $Y_i$ , the dependent variable measured as food expenditures away from home. The  $\beta$  coefficient expresses a positive or negative influence on food expenditures. If the beta coefficient is positive for a given independent variable, an increase in that variable results in an increase in food expenditures away from home.

In the next section, I report results from several regressions to analyze differences between the models and compare the usage of three alternative dependent variables measuring state-level food expenditures per capita away from home.

## VI. Results

As previously stated, I use the OLS method to analyze the effects of the independent variables on alternative specifications of the dependent variable, food expenditures away from home. The first column of Table 2 lists the independent variables and the other three columns display the results for each of the model specifications. The alternative dependent variables considered include: estimated per capita restaurant sales, regionally-adjusted food at home (which is used for comparison), and regionally-adjusted food away from home expenditures. Table 2 displays the coefficient estimates for each variable and alternative levels of statistical significance are represented with asterisks.

<b>Table 2: Results</b>			
	<b>Model 1: Estimated Per Capita Restaurant Sales</b>	<b>Model 2: Adjusted FAH</b>	<b>Model 3: Adjusted FAFH</b>
Age 65+	45.48	19.87	-12.98
Age 0-5	-281.42 *	-265.92	-213.01
White	-16.45***	2.53	-2.46
Building Permits	-160.49*	-158.63	-132.73
HHS	1335.31**	1615.34**	1263.44**
Bachelor's Degree	-23.14	2.67	3.74
Female LFPR	20.04	-52.94	-74.74**
Avg Travel Time to Work	-28.71	-49.70	-61.69**
Income	0.04	0.03	0.03
Poverty	-9.90	-85.14*	-92.04**
Restaurants Per Sq. Mi	178.35	110.60	2.23
Incoming Flights	0.03***	-0.003	-0.0006
Telecommuting	-0.002***	0.0001	0.00003
Observations	50	48	48
Adjusted R <sup>2</sup>	0.6142	0.4229	0.4006
F-Statistic	7.00***	3.65***	3.42***

\*\*\* Denotes significance at 99% confidence level

\*\* Denotes significance at 95% confidence level

\* Denotes significance at 90% confidence level

Several variables did not exhibit the expected signs, and the signs of the same independent variable differ between alternative specifications of the dependent variable. In the first model which uses estimated per capita restaurant sales as the dependent variable, percent of whites, incoming flights, and telecommuting are statistically significant at the 10% level. Household size is significant at the 5% level. Lastly, at the 1% level, age 0-5 and building permits are statistically significant. The building permits variable does not possess the expected sign. While I expected its coefficient to be positive (demonstrating that if the economy expands, consumers spend more disposable income purchasing food away from home), the sign is negative. It is possible that construction hinders access to restaurant buildings, and it will be more challenging to access restaurants the longer construction lasts. The percentage of whites also did not display the expected sign. Age 0-5 and telecommuting possess negative coefficients as expected. As the percentage of kids age 0-5 increases or more people telecommute, people purchase less food away from home. Household size and incoming flights positively impact estimated per capita restaurant sales. An increase in household size results in higher food expenditures away from home, *ceteris paribus*. The same holds true for incoming flights.

In Model 3 which uses the modified dependent variable of the fraction of per capita income spent on food away from home in each state, household size, female LFPR, commute time, and poverty all exhibit statistical significance. Household size stands alone as the only statistically significant variable with a positive coefficient. Female labor force participation rate and commute time display negative coefficients in this model which negates the theory considered. Generally, as more females participate in the labor force, they will consume more food from restaurants; however, my findings contrast that viewpoint. When an individual spends more time driving to and from work, it would appear more favorable to consume from restaurants. The poverty coefficient holds a negative coefficient as expected. Lower income prompts individuals to consume more food at home where meals cost less. Household size is the only variable that is statistically significant in all three models. A higher household size increases all food expenditures, irrespective of how the dependent variable is measured. Seemingly, this makes sense as larger families spend more than smaller families. If the dependent variable measured number of meals away from home, the result would likely be negative. Working from home displays a negative coefficient in the first model as expected, but this coefficient is positive in the regionally-adjusted food away from home model, conveying the importance of model specification.

Upon further analysis, it became evident that the high number of independent variables exhausts the limited degrees of freedom available in a model with 50 observations. The previous model also elicits multicollinearity concerns

between the variables of age 0-5 and household size, and average time to work and people telecommuting. I eliminate the household size variable because the positive results simply show that larger families spend more than smaller families, and do not provide additional insight to understand food consumption trends. I also remove incoming flights because of the lack of clarity in the data. Data incorporated in this analysis do not account for whether the passengers reached their final destination or if they experienced a lay-over. If the traveler had a lay-over, the state would not experience incremental sales as these people do not leave the airport and remain there only for a short period of time. For these reasons, I construct a simplified model. Table 3 displays the independent variables considered in this model and their expected signs.

<b>Table 3: List of independent variables and expected signs</b>	
<b>Independent Variable</b>	<b>Expected Sign</b>
Age 0-5	(-)
White	(+)
Building Permits	(+)
Female LFPR	(-)
Restaurants Per Square Mile	(+)
<i>Average Commute Time</i>	(+)
<i>People Telecommuting</i>	(-)

The italicized variables in Table 3 draw attention to the fact that I consider two alternative ways of measuring commuting behavior; one model includes average commute time and the other contains people telecommuting. Given their high degree of multicollinearity, these two independent variables would produce biased results if left together in the same model.

Equations 2 and 3 show the two alternative dependent variable measures (estimated per capita restaurant sales and regionally-adjusted per capita income spent on food away from home) considered relative to the independent variables listed in Table 3. Only average commute time measures commuting behavior in these equations.

Equation 2: **Estimated Per Capita Restaurant Sales** =  $\beta_0 + \beta_1(\text{Age 0-5}) + \beta_2(\text{White}) + \beta_3(\text{Building Permits}) + \beta_4(\text{Female LFPR}) + \beta_5(\text{Restaurants per sq mi}) + \beta_6(\text{Average Commute Time}) + \varepsilon_i$



Equation 3: **Regionally-adjusted per capita income spent on food away from home** =  $\beta_0 + \beta_1(\text{Age 0-5}) + \beta_2(\text{White}) + \beta_3(\text{Building Permits}) + \beta_4(\text{Female LFPR}) + \beta_5(\text{Restaurants per sq mi}) + \beta_6(\text{Average Commute Time}) + \varepsilon_i$

Table 4 displays results associated with the OLS estimation of Equations 2 and 3.

<b>Table 4: Results for Model including Average Commute Time</b>		
	Per Capita Estimated Restaurant Sales	Adjusted FAFH
Age 0-5	-167.13*	88.75
White	-23.32***	16.55 **
Building Permits	0.002	-0.0002
Female LFPR	29.06**	-1.56
Restaurant Per Sq. Mi	56.94	-14.93
<i>Average Commute Time</i>	<i>-4.31</i>	<i>28.61</i>
Observations	50	48
Adjusted R <sup>2</sup>	0.4418	0.0128
F-statistic	7.46***	1.10

\*\*\* Denotes significance at 99% confidence level

\*\* Denotes significance at 95% confidence level

\* Denotes significance at 90% confidence level

The results reveal no significance of average commute time on food away from home expenditures in either model. Restaurants per square mile and building permits also exhibit no significance. In the first model, female labor force participation maintains the expected positive coefficient, suggesting that as more females participate in the labor force, they elect to consume more food away from home. The negative and statistically significant coefficient for the Age 0-5 variable in the first model reflects that as the percent of kids age 0-5 increases, food expenditures away from home decrease. Lastly, the sign of the coefficient associated with the whites variable yields inconsistent results (negative in the per

capita estimated restaurant sales regression and positive in the regionally-adjusted per capita income spent on food away from home regression), yet this variable is statistically significant in each of the models.

Table 5 shows the results for the models when the People Telecommuting variable replaces the Average Commute Time variable in Equations 2 and 3.

<b>Table 5: Results for Model including People Telecommuting</b>		
	Per Capita Estimated Restaurant Sales	Adjusted FAFH
Age 0-5	-155.94**	42.88
White	-22.76 ***	12.67 **
Building Permits	0.002	-0.003
Female LFPR	29.17**	-4.56
Restaurant Per Sq. Mi	47.15	25.16
<i>People Telecommuting</i>	<i>0.00006</i>	<i>0.0007</i>
Observations	50	48
Adjusted R <sup>2</sup>	0.4415	0.0326
F-statistic	7.45***	1.26

\*\*\* Denotes significance at 99% confidence level

\*\* Denotes significance at 95% confidence level

\* Denotes significance at 90% confidence level

Many of the results in Table 5 are consistent with those in the previous model. People telecommuting is not statistically significant in either model and does not impact food expenditures away from home. Similarly, restaurants per square mile and building permits remain insignificant. Female labor force participation, again, exhibits the expected positive coefficient in the per capita estimated restaurant sales model. The negative, significant coefficient for age 0-5 reflects decreasing expenditures away from home as the percent of kids age 0-5 increases. For the

remaining statistically significant variable, whites, the same phenomena persists with the inconsistent coefficient signs between the two models.

It is unclear as to what causes the difference in coefficient signs when the dependent variable is measured in two alternative forms. The only major difference between the two models is that the adjusted FAFH model does not include Hawaii or Alaska because the two states do not belong to a U.S. region as defined by the source. Going forward, this requires more investigation. Another hypothesis as to why the difference occurs relates to the nature of the study. Since this is a one-year study, it is possible that there was something unique about 2018 that was unaccounted for in this research or in relation to the alternative measurements of the dependent variable in that particular year. A time series analysis could pinpoint some of these inconsistencies. The aforementioned concerns prompted me to conduct additional analysis. Given that income plays a large role in one's decision to consume food away from home, I ran another regression where income was added as an independent variable within the previous two models. The sign of the coefficient associated with the white variable was similar to the results displayed in Tables 4 and 5 for the two models.

These analyses lead me to conclude that the per capita estimated restaurant sales is a better measure of food expenditures away from home. In comparing the two models, the R-squared term is higher in the model using per capita estimated restaurant sales as the dependent variable and more variables are statistically significant. This model also yields more coefficient signs that align with economic theory and findings from previous research.

## **VII. Conclusion**

The purpose of this research is to examine socioeconomic factors influencing the rise in food consumption expenditures away from home in the U.S. in 2018. The age 0-5 and female labor force participation rate variables are both statistically significant and their coefficients display the expected signs. I plan to further analyze the difference in the coefficient signs relating to the percentage of whites variable in the two models. I include analysis on average commute time and people telecommuting to reflect societal change and contribute to this literature. Despite the hypotheses that higher commute times increase food expenditures away from home and higher rates of telecommuting decrease food expenditures away from home, I find average commute time and people telecommuting exhibit no statistically significant effects on food away from home expenditures. After comparing alternative specifications of the dependent variable in this analysis, I find per capita estimated restaurant sales to be a better measure of food expenditures away from home.

Future research could examine additional independent variables as well as dependent variable measures. While I considered many new variables (building permits, average commute time, incoming flights, and people telecommuting) in this research, numerous others remain that have not been considered in previous studies. Youth participation in extracurricular activities is another possible factor impacting food expenditures away from home. I expect food consumption away from home to increase as more youth participate in extracurricular activities. Parents transporting youth to these activities have less time available to cook and may look favorably upon purchasing food from a restaurant. Also, I used building permits as an economic measurement, but total jobs available per capita may be a better indicator of the state of the economy. If the economy experiences growth and a higher job availability, I expect food consumption expenditures away from home to increase. In order to draw full conclusions on the food away from home industry, it would be necessary to examine total meals consumed away from home as another alternative dependent variable. The NPD Group emphasized that the number of meals consumed away from home is not increasing, so an analysis of expenditures and meals will help develop a richer understanding of the dynamics of the food industry.

The results discovered in this study can inform those in the food service industry. Food service providers can identify characteristics of those who are consuming and target them with their marketing strategies. Further, the food service industry providers gain increased knowledge of those not consuming, so they may alter their services provided to attract those people not consuming food away from home currently.

Lastly, it will be interesting going forward to note the impacts from COVID-19. During this pandemic, grocery store items are being purchased rapidly while restaurants are not operating at full capacity. I am curious if the trend in food expenditures away from home will continue to rise once the COVID-19 pandemic subsides or if the pandemic has refocused societal norms toward in-home meal preparation.

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## Appendix A

<b>Quick Facts Statistics</b>	<b>Variable Name</b>	<b>Source</b>
Population Estimates	Age 0-5, Age 65+, White	<a href="https://census.gov/programs-surveys/popest.html">census.gov/programs-surveys/popest.html</a>
American Community Survey	Age 0-5, Age 65+, White, HHS, Bachelor's Degree, Female LFPR, Mean Travel Time to Work, Income, Poverty	<a href="https://census.gov/programs-surveys/acs/">census.gov/programs-surveys/acs/</a>
Building Permits	Building Permits	<a href="https://census.gov/construction/bps/">census.gov/construction/bps/</a>