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# COVID-19 Working Paper: The Effects of COVID-19 on Food Sales

By Xiao Dong and Eliana Zeballos

## Abstract

This article investigates the effects of economic recessions and changes in local economic conditions on the growth of food-at-home and food-away-from-home sales at the county level and estimates the likely impacts of the COVID-19-induced recession on food sales. On average, we show the recessionary effects of COVID-19 are likely to increase the growth of food-at-home sales by 1 percent and decrease the growth of food-away-from-home sales by 0.9 percent. These results indicate the recessionary effects of COVID-19 on food sales are small compared to the pandemic and public health effects of COVID-19 on food sales.

**Keywords:** COVID-19, pandemic, recession, food sales, FAH, food at home, FAFH, food away from home, food services, retail food, restaurants, county-level unemployment, USDA, U.S. Department of Agriculture, ERS, Economic Research Service.

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## Summary

### What Is the Issue?

The COVID-19 pandemic has significantly affected food-at-home (FAH) and food-away-from-home (FAFH) sales in the United States. The advance monthly sales for retail and food services released by the Bureau of the Census on September 16, 2020, indicated that food and beverage in-store sales for the first 8 months of 2020 were up 12.2 percent compared with 2019. Meanwhile, sales for foodservice and drinking places sales for the first 8 months of 2020 were down 20.9 percent compared with 2019. A potential reason for the significant change is the COVID-19-induced recession.

Like previous economic shocks and recessions, COVID-19 has affected household income and will likely continue to influence FAH and FAFH spending. The magnitude of the impact on food sales hinges on the severity of the local economic shock, and it can vary geographically in part because of differing mixtures of industries across locations. However, the major driver of the recession—the COVID-19 pandemic—has also led to mobility restrictions, lowered consumer shopping, and reduced operations of FAFH establishments, confounding factors that also affect food sales. A key question this paper examines is can we separate the effects of the COVID-19 recession versus the other effects of the COVID-19 pandemic on food sales?

### What Did the Study Find?

This project simulated the impact of recession income shocks on FAH and FAFH sales at the county level in the United States by modeling food sales as a function of changes in income and employment. We projected the effect of the COVID-19 recession on county-specific FAH and FAFH sales in 2020 under three possible scenarios—pessimistic, optimistic, and mid-range. We find that:

- An economic recession increases the growth of FAH sales by 2.32 percentage points.
- A 1- percentage point decrease in a county's growth of the employed population is correlated with a decrease of 0.09 and 0.32 percentage points in the growth of FAFH sales in nonmetro and metro areas, respectively, and an economic recession decreases the growth of FAFH sales by 1.97 percentage points.
- On average, the growth rate of FAH sales in 2020 is projected to increase between 1.1 and 0.9 percentage points under the respective optimistic and pessimistic assumptions about 2020 economic conditions. For optimistic and pessimistic scenarios, the growth rate of FAFH sales in 2020 would decrease by 0.8 (optimistic) or 1.1 (pessimistic) percentage points, respectively.

- In comparison, the growth rate of FAH sales has increased by 3 percent (Food Expenditure Series) compared to the 1- percent increase predicted by the income shock. The growth rate of FAFH sales has decreased by 23 percent (Food Expenditure Series) compared to the 1- percent decrease predicted by the income shock. The results showed that the significant changes in food sales, especially in FAFH sales, are not primarily because of the COVID-19-induced recession.

## How Was the Study Conducted?

We used historical recessions to simulate the impact of the COVID-19-induced recession on food sales. Simulated changes in FAH and FAFH sales are based on a model of sales as a function of unemployment and other variables. We used the National Establishment Time Series (NETS) database for data on FAH and FAFH sales; data on unemployment came from the Bureau of Labor Statistics. NETS is a longitudinal database that records the sales, employment figures, growth, and performance against industry peers for specific business locations across time created by Dun & Bradstreet and Walls & Associates. Each unit of observation in NETS reports the annual sales revenue for each establishment from 1990 to 2015.

For the optimistic scenario, we assumed the average annual employment for 2020 would be like the average of the first 3 months of 2020, which includes the pre-recession month of January. For the pessimistic scenario, we assumed the average annual employment for 2020 would be like June of 2020 after the recession started. Finally, we present a scenario that is midway between the optimistic and pessimistic scenarios.

We compared the simulated effects of the COVID-19 recession on food sales to the actual effects of COVID-19 on food sales as measured by the Food Expenditure Series (FES) to separate the recession and other pandemic effects of COVID-19 on food sales. This project provides a perspective on consumer responses and consumer behavior for food in the United States during recessions and pandemics.

## Introduction

On average, household expenditures on food and beverages account for 12.9 percent of total spending in the United States, ranking only behind housing (32.8 percent) and transportation (15.9 percent) (USDA, Economic Research Service [ERS], 2020). Shocks to household income can affect household consumption decisions (Jappelli and Pistaferri, 2010) and, therefore, spending on food. Economic downturns lead to higher unemployment and reduced household income, changing both the portion of food expenditures of the household budget and the total expenditures on food and beverages (Todd, 2014). Kumcu and Kaufman (2011) show that total food spending by U.S. households declined 5 percent during the Great Recession between 2006 and 2009.<sup>1</sup>

Furthermore, the change in household income can shift purchasing and consumption patterns within food groups and types of food (Griffith et al., 2016; Dave and Kelly, 2012). Factors related to recessions, such as changing work schedules, financial stress, shifts in physical activity, loss of employer-sponsored health insurance, and the reduction in income itself, can alter household consumption and saving decisions, leading to changes in food purchase patterns (Todd, 2014).

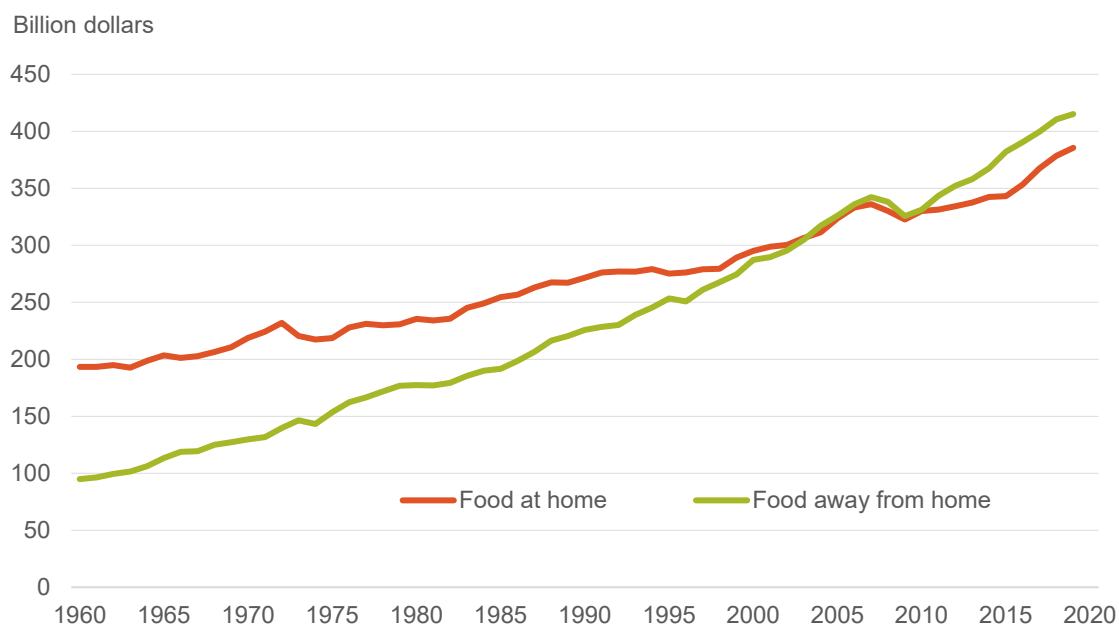
There are two main components of household expenditures on food: food at home (FAH) and food away from home (FAFH). Figure 1 shows the historical trends in FAH and FAFH spending across time adjusted for inflation. Spending on both FAH and FAFH has been gradually increasing over the last 8 decades, except for decreases in food spending during major economic shocks such as the Great Recession. However, FAFH spending is trending upwards more rapidly over time and surpassed FAH expenditures in 2004. FAFH and FAH both comprise about half of the shares of total food expenditures. While both FAFH and FAH decreased during the Great Recession (2008-09), FAFH decreased more, showing the more salient effect that the recession had on FAFH versus FAH.

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<sup>1</sup> Decreased food spending does not necessarily indicate less food volume is consumed. Reduced food spending could stem from substitution to lower quality foods, cheaper alternatives, and fewer prepared foods that require more labor hours.

Figure 1

### Spending on food at home and food away from home, 1960-2020



Source: USDA, Economic Research Service (ERS) using data from the ERS 2019 Food Expenditure Series. Year-to-year changes are calculated on sales in 1988 dollars and includes taxes and tips.

The shift in food shares, especially between FAH and FAFH spending, can have implications for diet quality and present another avenue for health outcomes to change from economic shocks. A wide range of literature explores how economic shocks and job loss influence health outcomes in both the United States and other developed countries (see, for example, Deb et al., 2011; Dehejia and Lleras-Muney, 2004; Economou et al., 2008; Ruhm, 2000; 2003; 2005). Based on the most recent food intake data from the USDA, Agricultural Research Service (ARS), and monthly food spending data from the USDA, ERS, FAFH spending per calorie consumed is slightly over twice per-calorie FAH spending. Other studies have shown that FAFH tends to be of lower nutritional quality than FAH (Lin and Guthrie, 2012). Todd et al.

(2010) finds that even after controlling for individual tastes and preferences, consumption of FAFH increases total caloric intake and reduces diet quality among adults and children.<sup>2</sup>

With reduced household food spending, both FAFH and FAH establishments will potentially experience reduced sales and growth. Pearce and Michael (2006) find that more than 500,000 businesses failed during each post-World War II recession in the United States. Agriculture, food, and related industries comprise roughly 5.4 percent of the U.S. gross domestic product (GDP) (USDA ERS, 2020). In terms of employment, agriculture and related food industries, including eating and drinking places and food/beverage stores, account for 11 percent of U.S. employment (USDA ERS, 2020). As the food sector comprises a significant portion of the U.S. economy, the decrease in food spending may likely have a major impact on the entire economy.

Like most economic recessions, the effects of COVID-19 shock have already impacted FAH and FAFH sales in the U.S. food industry. For households, the effects of COVID-19 will likely cause income shocks and shifts in FAH and FAFH spending. The COVID-19 pandemic will likely lead to a greater substitution of sales of FAFH towards FAH because of stay-at-home orders and FAFH establishments either operating on a limited capacity or ceasing operations completely more than because of increased unemployment and decreased income. The Bureau of Labor Statistics' (BLS) April jobs report showed a decrease in total employment by 20.5 million compared with March (BLS, 2020).

A study commissioned by the National Sustainable Agriculture Coalition (Thilmany et al., 2020) predicts up to a 20 percent decrease in annual FAFH sales caused by COVID-19. A March survey by the Beard Foundation (2020) of almost 1,500 restaurant industry leaders shows that almost 75 percent of those forced to close think they will be unable to open after 2 months, and 80 percent are uncertain whether retooling to offer delivery and takeout will sustain them. Baker et al. (2020) estimates that restaurant spending declined by approximately one-third in March when the national emergency was declared. The advance monthly sales for retail and food services released by the Bureau of the Census on September 16, 2020, indicated that food and beverage store sales for the first 8 months of 2020 were up 12.2 percent

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<sup>2</sup> This is less clear-cut for children. Those qualifying for reduced-price school meal programs may eat healthier away from home.



compared with 2019. Meanwhile, food services and drinking places sales for the first 8 months of 2020 were down 20.9 percent compared with 2019.

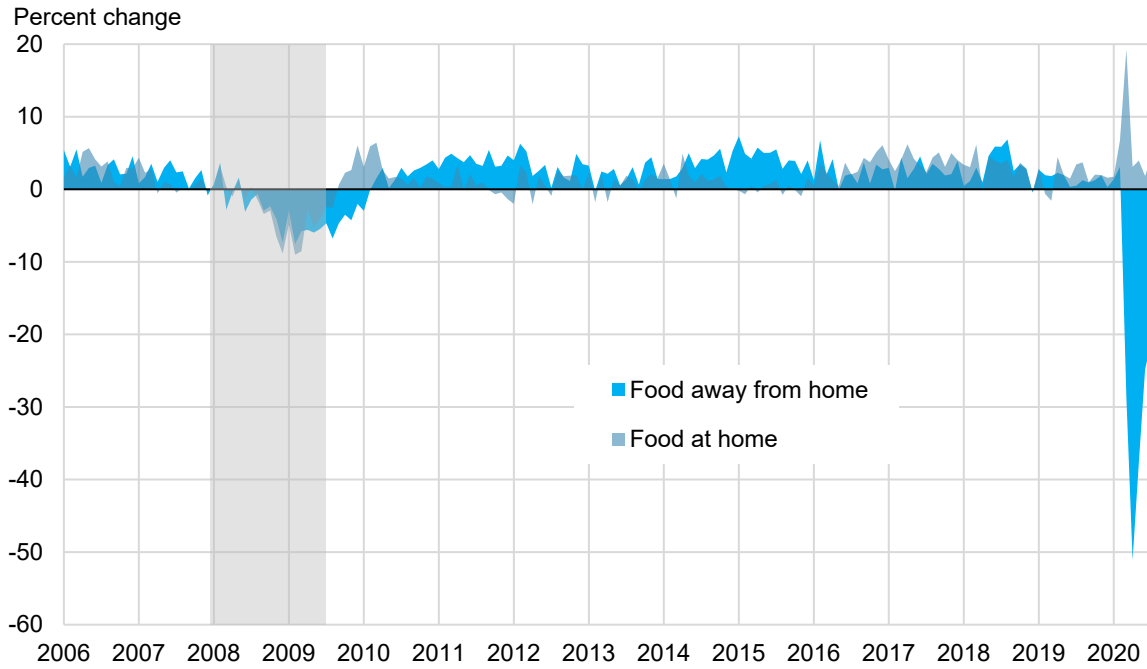
Moreover, using the USDA, ERS Food Expenditure Series (FES), we found that inflation-adjusted expenditures at grocery stores, supercenters, convenience stores, and other retailers (food at home) were 19.3 percent higher in March 2020 when the stay-at-home orders started compared with March 2019. However, during the second quarter of 2020 (April-June), FAH expenditures were 3 percent higher on average compared with April-June 2019.<sup>3</sup> Inflation-adjusted March 2020 expenditures at FAFH establishments—restaurants, school cafeterias, sports venues, and other eating-out places—were 28.6 percent lower than March 2019 expenditures. FAFH expenditures during the second quarter of 2020 were 37.9 percent lower on average compared with April-June 2019 spending (Figure 2).

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<sup>3</sup> We compared spending for the same month to account for seasonal food spending patterns.

**Figure 2**

Year-to-year change in inflation-adjusted monthly U.S. expenditures for food at home and food away from home, 2006-20



Notes: Expenditures include spending on foods and beverages by consumers, businesses, and government entities. Orange and blue areas show the percent change from the previous year for each month. Year-to-year changes are calculated on sales in 1988 dollars. Grey bar indicates the 2007-09 recession.

Source: USDA, Economic Research Service (ERS) using data from ERS's Food Expenditure Series.

However, the magnitude of the impact on food sales will likely be heterogenous across spatial locations as the effects likely hinge on the severity of the local shock, which can vary across geographic locations partly because of varying industrial compositions. This paper analyzes the potential impact on FAH and FAFH sales at the county level caused by the COVID-19 income shock in the U.S. in 2020. Moreover, this paper provides a perspective on the response and behavior of food sales in the United States during economic recessions in general. We use county-level employment to capture local economic shocks over time and study the behavior of food sales around these events for FAH and FAFH, as well as for traditional supermarkets, limited-service restaurants, and sit-down restaurants.

The changes in FAH and FAFH expenditures are not only driven by income shock but also by household substitutions since many FAFH establishments are operating in a limited capacity or have ceased operations completely. Furthermore, the COVID-19 pandemic has led to drastic changes in consumer consumption patterns because of mobility restrictions in the form of lockdowns and stay-at-home orders. Consumers' fear of infection from a contagious virus also altered shopping patterns and associated consumption decisions. In this study, we compare our simulated recession income shock effects on food sales to the actual changes in growth of FAH and FAFH sales to separate the recession and pandemic effects of COVID-19.

This study makes several contributions to the literature and highlights potential economic challenges at the county level. First, we extended the literature on shifts in the overall growth rate of household food expenditures and FAH and FAFH spending because of recession-driven income shocks. Second, we focused on the change in household food expenditures driven by changes in local economic conditions as we rely on county-level data. Finally, we projected the likely shift in the growth rate of food spending and the associated impact on FAFH and FAH establishments caused by the looming income shock from COVID-19 at the county level, enabling identification of the counties that will experience the most salient effects. Furthermore, we present evidence that recession effects on FAH, and especially FAFH, sales are small compared to the pandemic effect.

## **Data**

To examine county-level household spending, we used sales at FAH and FAFH establishments to measure the total household spending on FAH and FAFH in a specific geographic area during a specific time range. For data on FAH and FAFH sales, we used the National Establishment Time Series (NETS) database, a longitudinal database that records the sales, employment figures, growth, and performance against industry peers for specific business locations across time. Dun & Bradstreet and Walls &

Associates created NETS by using Dun & Bradstreet’s archival data from surveys of establishments (Walls & Associates, 2013). Each unit of observation in NETS reports the annual sales revenue for each establishment from 1990 to 2015. NETS has been intensively used in recent studies that rely on yearly variations for identification as the database was created to focus on establishment and firm-level growth and performance across time.

Recent literature has shown NETS captures the food environment relatively well compared to the official Bureau of the Census’ Economic Census, and NETS is ideal for researchers attempting to measure store sales over time (Cho et al., 2019). To our knowledge, this is the only database providing store-level information that includes sales in a time-series format. NETS also includes street addresses and geocodes for each store, which allows us to identify the county where the establishment is located. NETS contains business establishments from a comprehensive list of industries, and the database categorizes establishments using the North American Industrial Classification System (NAICS) and the Standard Industrial Classification (SIC) numeric codes. To identify food spending at the county level, we use NAICS codes to select only the establishments that sell food, and we based our selection on the methodology used by the USDA, ERS’s Food Expenditures Series.<sup>4</sup>

To further identify FAH and FAFH spending, we used product and services codes (PSCode), which the Bureau of the Census uses when it prepares the product line reports detailing the percentage of sales by product and contributing industry. We selected all the PSCodes related to food and nonalcoholic beverages and classified them as FAH if they were sold for off-premise consumption or as FAFH if they were sold for on-premise consumption. We calculated the average of these percentages from the 2002,

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<sup>4</sup> The following NAICS codes were used to identify food sales:

441, 442, 443, 444, 44511, 44512, 4452, 4453, 446, 447, 448, 451, 452111, 452112, 45291, 45299, 453, 4541, 4542, 4543, 51213, 6114, 6115, 6116, 622, 623, 7111, 7112, 7113, 7114, 7115, 712, 7131, 7132, 7139, 721, 72231, 72232, 72233, 7224, 722511, 722513, 722514, 722515, 8111, 8132, 8133, 8134, 8139.

2007, and 2012 product line reports for each state.<sup>5</sup> Using these percentages, we then calculated the portion of FAH and FAFH sales for each establishment in NETS using its NAICS code.

Recent studies have raised concerns about using NETS data for certain research questions surrounding firm and business dynamics (Barnatchez et al., 2017; Crane and Decker, 2019) as a significant portion of sales data in NETS is imputed based on firm-level employment numbers. However, our use of NETS data for this study was not affected by concerns from data imputation. The main concern from Crane and Decker (2019) revolves around examining micro-level business dynamics using NETS. However, as we aggregated to the county level and focused on food sales, our results are not relevant to the concerns raised in Crane and Decker (2019). Barnatchez et al. (2017) showed that in correlations of county-level aggregates between NETS and Census data, the official standard is high, indicating county-level aggregates are relatively accurate. Additionally, at the spatial location by industry by establishment level, correlations between NETS and official sources are reassuringly strong in appropriately restricted samples. In our study, we focused on both a restricted sample (the food industry) and aggregate to the county level, which meet both criteria suggested in Barnatchez et al. (2017).

For the concern that sales are correlated to unemployment since firm sales are imputed on firm employment, we used overall total employment at the county level across all industries and not at the firm level nor the food sales level. Overall, employment may not be correlated with employment of specific industries during recessions, and business cycles in the food industry (consumption) are typically different than business cycles in other industries.

We used local employment as an indicator of local economic conditions and the severity of the economic shocks in each county. The BLS constructs county-level unemployment estimates by combining state-level data from its Current Population Survey with county-level counts of unemployment insurance claimants. Data on annual county-level unemployment and employment start in 1990, similar to the

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<sup>5</sup> We use the following for FAH: 20100, 20101, 20102, 20103, 20104, 20111, 20112, 20113, 20114, 20116, 20117, 20118, 20119, 20121, 21105, 21106, 21107, 21108.

We use the following for FAFH: 20120, 20122, 20124, 21100, 21101, 21102, 21103, 21104, 21111, 21112, 21113, 21210, 21211, 21212, 21213, 21214, 21220, 21221, 21222, 21223, 21224, 21225, 21226, 21227, 21228, 39200, 39201, 39460, 39461, 39609, 39679.

NETS database.<sup>6</sup> We used annual county-level employment data from 1990 to 2015, which corresponds to the timespan of the NETS data in our regression analysis. To examine the projected change in food sales at the county level because of COVID-19 in 2020, we used the most recent county-level employment figures from BLS. The BLS publishes monthly county-level employment numbers for the latest 18 months, and we used the employment data from January 2020 to June 2020.

## Methodology

To estimate the correlation of changes in local economic conditions and shocks with food sales, we used equation 1. Equation 1 indexes county  $c$  and year  $t$ , and regresses the growth rate of food sales on the growth rate of employment at the county level and economic shocks. We approximated the growth rate of food sales by differencing the log of food sales in the dependent variable and the growth rate of employment by differencing the log of employment. By using growth rates, we controlled for potential seasonality and non-stationarity in the data. We also controlled for national economic shocks with the dummy variable  $recession_t$ , where  $recession_t$  equals 1 for the years 1990, 1991, 2001, 2008, and 2009 (periods of recession according to the National Bureau of Economic Research [NBER]). Furthermore, we looked at whether the results are different for metro and nonmetro areas by interacting the growth rate of employment with an indicator equal to 1 if the county is in a metropolitan area.<sup>7</sup> We deflated the dollar value for the sales using the Consumer Price Index for food at home and food away from home from BLS.

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<sup>6</sup> County-level labor data from BLS can be found on their website.

<sup>7</sup> Data from USDA, Economic Research Service (2020) found online on the ERS website Food Expenditure Series webpage.

### Equation 1

$$\log(\text{Sales}_{ct}) - \log(\text{Sales}_{ct-1}) = \beta_0 + \beta_1[\log(\text{employment}_{ct}) - \log(\text{employment}_{ct-1})] + \beta_2\text{recession}_t + \beta_3\text{Metro}_c + \beta_4[\log(\text{employment}_{ct}) - \log(\text{employment}_{ct-1})] * \text{Metro}_c + \text{CountyFixed}_c + \varepsilon_{ct}$$

To project the expected change in the growth of all food sales, FAH and FAFH, we used the results of equation 1 for equation 2, where we multiplied  $\beta_1$ , the change in sales growth caused by the change in employment growth with the growth in county-level employment in 2020, and added the effect for economic recessions,  $\beta_2$ . For the projected change in employment growth for the whole of 2020, we presented three possible scenarios. In the optimistic scenario, we assumed the annual change in employment growth in 2020 to be like the average of the first 3 months of 2020 (January-March). This is the optimistic scenario as the most drastic change in the economy occurred during March 2020, and it assumed that the 3-month average will rebound to the January and February conditions by the end of the year. For the pessimistic scenario, we assumed the June employment numbers to be similar for the whole of 2020 as the economy drastically worsened during March. For the midpoint scenario, we assumed the employment numbers to be between the optimistic and pessimistic scenarios.

### Equation 2

$$\begin{aligned} \text{ExpectedChangeinSaleGrowth}_c & \\ &= \beta_1\text{ExpectedGrowthinEmployment}_c + \beta_2 + \beta_3\text{Metro}_c \\ &+ \beta_4\text{ExpectedGrowthinEmployment}_c * \text{Metro}_c \end{aligned}$$

We also estimated the correlation of changes in local economic conditions and recession with FAH versus FAFH sales and with sales of limited-service restaurants, full-service restaurants, supermarkets, other FAH, and other FAFH.

## Results

Table 1 shows the results of the regression using equation 1. In the first column, we regressed on all food sales and show that a 1-percentage point decrease in the growth of a county's employed population is associated with a 0.07 percentage point decrease in the growth of all food sales in counties located in nonmetro areas and a 0.16 percentage point decrease in the growth of all food sales in counties located in metro areas. An economic recession is associated with a 0.62 percentage point increase in the growth of

all food sales. In the second column, we regressed on FAH sales and see no significant change in the growth of FAH sales associated with the growth of the county-employed population for counties located in nonmetro areas nor for counties located in metro areas.

However, an economic recession seems to significantly affect the growth of FAH sales, which increases by 2.39 percentage points. In the third column, we regressed on FAFH sales and see a similar but larger effect where a 1-percentage point decrease in the county growth of employed population is associated with a 0.09-percentage point decrease in the growth of FAFH in counties located in nonmetro areas, and 0.32-percentage point decrease in the growth of FAFH in counties located in metro areas. An economic recession decreased the growth of FAFH sales by 1.97 percentage points. The results indicated there is substitution between sales of FAH and FAFH during economic recessions, and FAFH is more sensitive to local economic conditions.



Table 1

**First difference regressions of growth of sales on the growth of employed population**

Growth of sales	All food	FAH	FAFH
Growth of employed population	0.07*** (0.024)	0.06 (0.042)	0.09*** (0.025)
Recession	0.62*** (0.145)	2.39*** (0.234)	-1.97*** (0.167)
Growth of employed population *metro area	0.09* (0.045)	0.070 (0.062)	0.23*** (0.065)
Constant	0.21*** (0.029)	-0.86*** (0.045)	2.16*** (0.036)
Calculated full effect	0.23*** (0.035)	0.18*** (0.043)	0.31*** (0.039)
Observations	54,526	54,526	54,526
R-squared	0.038	0.033	0.041
Number of counties	3,212	3,212	3,212

Note: Each column is regressed separately. FAH = food-at-home; FAFH = food-away-from-home. Recession: Dummy variable is equal to 1 if the year is equal to 1990, 1991, 2001, 2008, and 2009, and zero otherwise. The National Bureau of Economic Research definition for recession is generally presented on a quarterly basis. We assume if any of the recession falls into a year for even a quarter (as in 1991), the recession dummy equals 1 for that year. The growth of employed population coefficient reflects the correlation of growth of employed population for counties in nonmetro areas. The calculated full effect coefficient reflects the correlation of growth of employed population for counties in metro areas. Additional controls include county fixed effects. Coefficients in percent point form. Robust standard errors in parentheses. \*\*\* p<0.01.

Source: USDA, Economic Research Service using data from the National Establishment Time Series and the Bureau of Labor Statistics.

In table 2, we further regressed on the growth of sales of limited-service restaurants, full-service restaurants, supermarkets, other FAH, and other FAFH. Supermarkets and other grocery (except convenience) stores are establishments primarily engaged in retailing a general line of food. Other FAH includes convenience stores, specialty food stores, warehouse clubs and supercenters, and any other retailers that sell food for off-premise consumption, but it is not their primary business. Limited-service restaurants are establishments primarily engaged in providing food services (except snack and nonalcoholic beverage bars) where patrons generally order or select items and pay before eating. Full-service restaurants are establishments primarily engaged in providing food services to patrons who order and are served while seated (i.e., waiter/waitress service) and pay after eating.

Other FAFH includes cafeterias, grill buffets, buffets, snacks, nonalcoholic beverage bars, and any other retailers that sell food for on-premise consumption, but it is not their primary business. Results showed that economic recessions will increase the growth of supermarkets and other grocery stores (except convenience stores) sales by 0.65 percentage point and have a significant positive effect on other FAH, increasing their sales growth by 5.47 percentage points. On the other hand, results showed that both sales of limited and full-service restaurants are also sensitive to the economic shock, with sales growth reduced by 1.48 percentage points and 2.44 percentage points, respectively, compared with sales at other FAFH (2.26 percentage points). Limited-service restaurants are probably less sensitive to changes in employment and recessions as limited-service restaurants are often cheaper.

Table 2  
**First difference regressions of growth of sales on the growth of employed population**

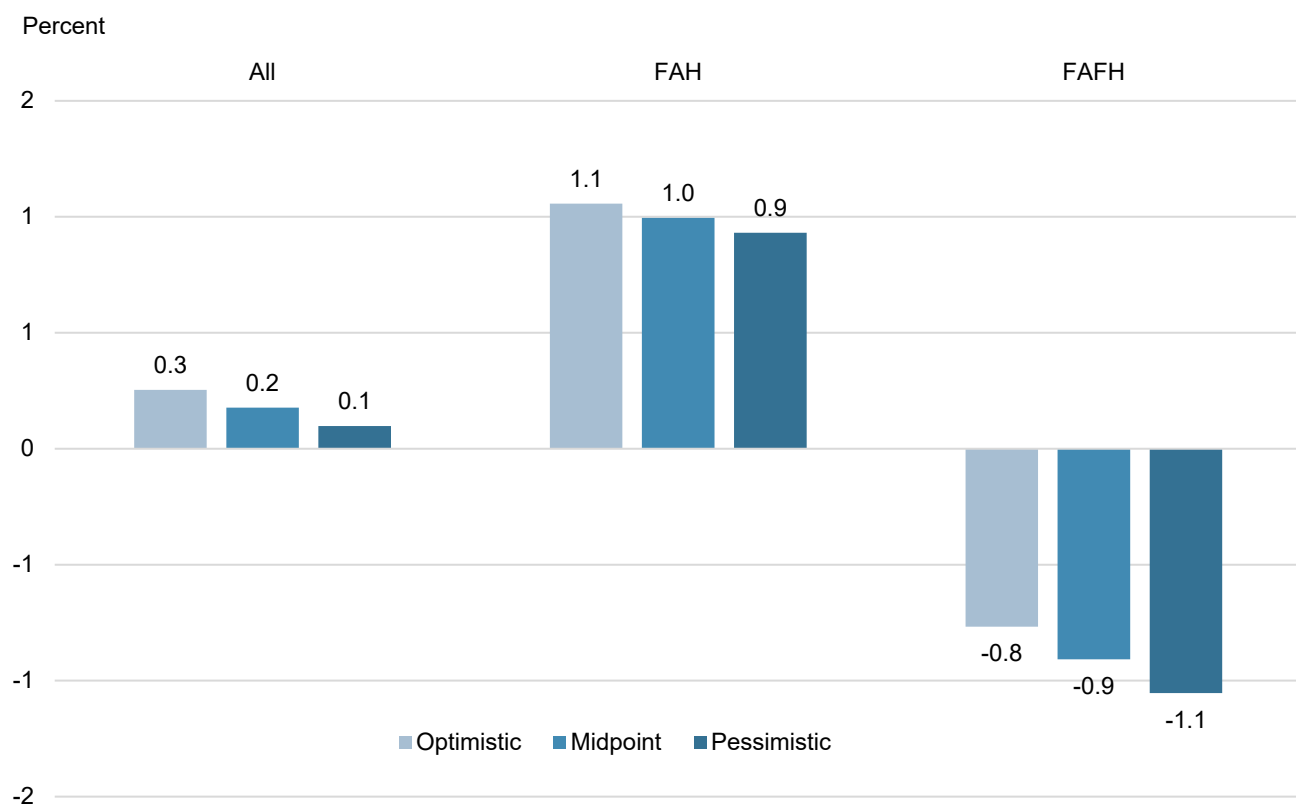
Growth of sales	Supermarkets & other grocery (except convenience)	Other FAH	Limited-service restaurants	Full-service restaurants	Other FAFH
Growth of employed population	0.11*** (0.034)	-0.02 (0.047)	0.06* (0.030)	0.08** (0.031)	0.15*** (0.021)
Recession	0.65*** (0.236)	5.47*** (0.367)	-1.48*** (0.262)	-2.44*** (0.236)	-2.26*** (0.177)
Growth of employed population *metro	0.030 (0.067)	0.19** (0.085)	0.16* (0.087)	-0.11* (0.064)	0.17*** (0.059)
Constant	-2.04*** (0.046)	1.29*** (0.071)	3.23*** (0.056)	-0.23*** (0.046)	4.32*** (0.038)
Calculated full effect	0.33*** (0.071)	0.17*** (0.053)	0.20*** (0.060)	0.18*** (0.039)	0.37*** (0.058)
Observations	54,083	54,039	52,095	53,789	51,767
R-squared	0.038	0.034	0.045	0.037	0.056
Number of counties	3,105	3,208	3,204	3,212	3,212

Note: Each column is regressed separately. FAH = food-at-home; FAFH = food-away-from-home; Shock: Dummy variable is equal to 1 if the year is equal to 1990, 1991, 2001, 2008, and 2009, and zero otherwise. The National Bureau of Economic Research definition for recession is generally presented on a quarterly basis. We assume if any of the recession falls into a year for even a quarter (as in 1991), the recession dummy equals 1 for that year. The growth of employed population coefficient reflects the correlation of growth of employed population for counties in nonmetro areas. The calculated full effect coefficient reflects the correlation of growth of employed population for counties in metro areas. Additional controls include county fixed effects. Coefficients already in percent form. Robust standard errors in parentheses. \*\*\* p<0.01.

Source: USDA, Economic Research Service using data from the National Establishment Time Series and the Bureau of Labor Statistics.

Using the results, we projected the change in food sales growth across counties because of the COVID-19 recession. Figure 3 shows the projected change in the growth of all food spending, FAH, and FAFH. Figures 4 and 5 show the projected change in the growth of food spending in supermarkets, other FAH, limited-service restaurants, full-service restaurants, and other FAFH. On average, the growth of all food spending is projected to increase slightly—0.3 and 0.1 percentage points, respectively—in the optimistic and pessimistic outcomes. The growth of FAH is projected to increase between 0.9 and 1.1 percentage points, and the growth of FAFH is projected to decrease between 0.8 and 1.1 percentage points. Traditional supermarkets are projected to decrease between 2 and 2.2 percentage points while other FAH stores are projected to change between an increase of 6.5 percentage points and a decrease of 6.4 percentage points. The projected decrease of full-service restaurants is 2.8 percentage points, while limited-service restaurants are projected to increase between 0.9 and 1.1 percentage points.

Figure 3  
**Projected change in food sales growth because of the COVID-19 recession**

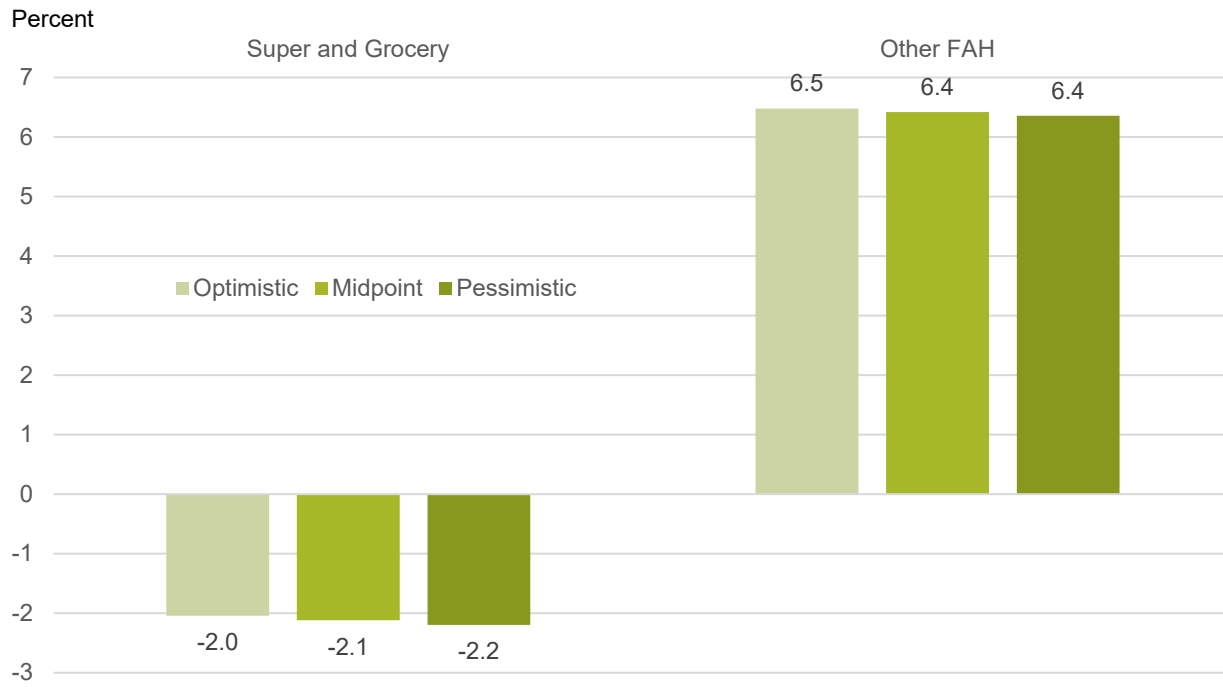


Notes: FAH = food-at-home; FAFH = food-away-from-home.

Source: USDA, Economic Research Service forecasted estimates using data from the National Establishment Time Series and the Bureau of Labor Statistics.

Figure 4

**Projected change in food sales growth because of the COVID-19 recession by type of food-at-home establishments**

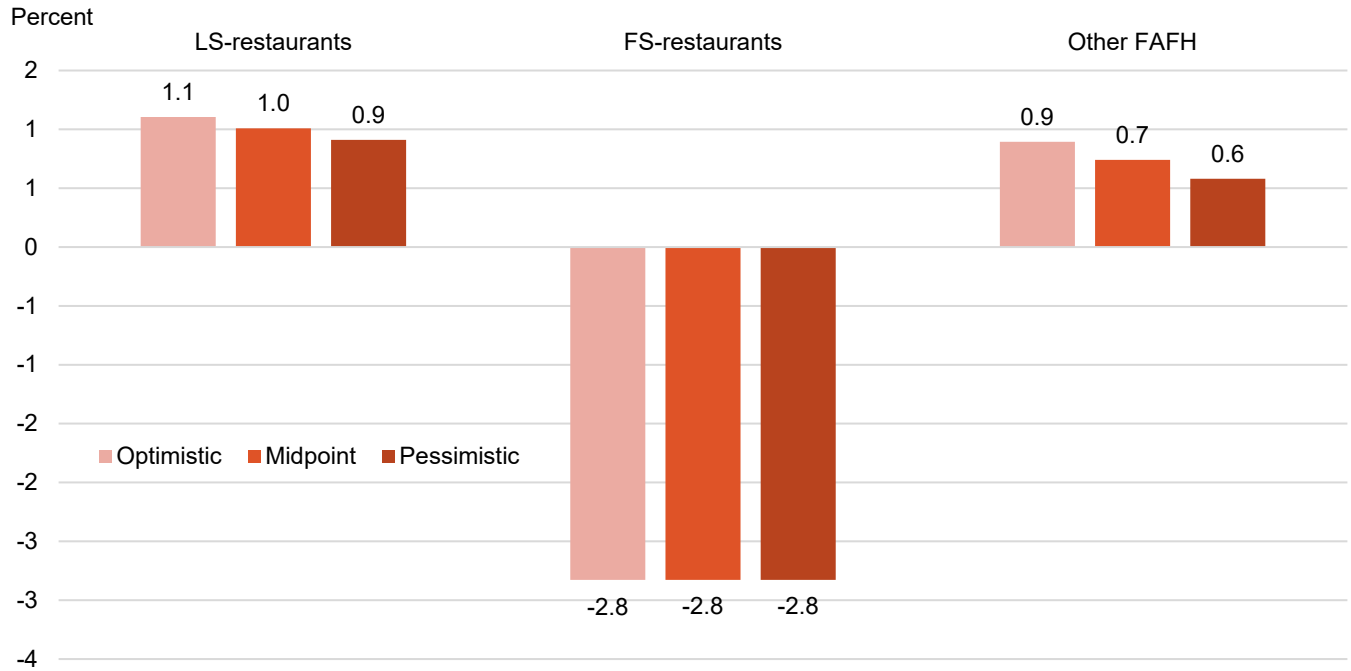


Notes: FAH = food-at-home.

Source: USDA, Economic Research Service forecasted estimates using data from the National Establishment Time Series and the Bureau of Labor Statistics.

Figure 5

**Projected change in growth by type of food-away-from-home establishment**

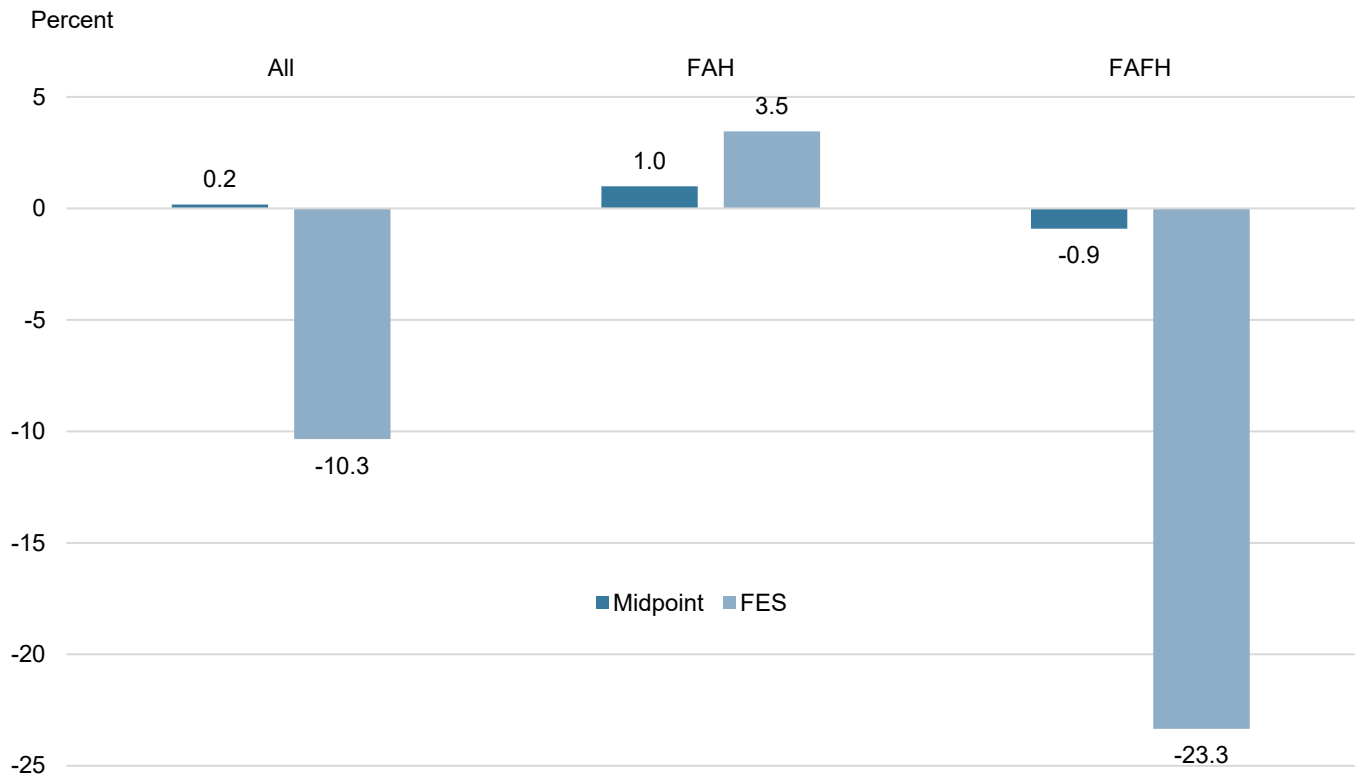


Notes: FAFH = food-away-from-home; LS = limited-service, FS = full-service.

Source: USDA, Economic Research Service forecasted estimates using data from the National Establishment Time Series and the Bureau of Labor Statistics.

Figure 6

**Projected change in food sales growth because of the COVID-19 recession compared to actual change in growth based on the Food Expenditure Series**



Notes: FAH = food-at-home; FAFH = food-away-from-home; FES = Food Expenditure Series.

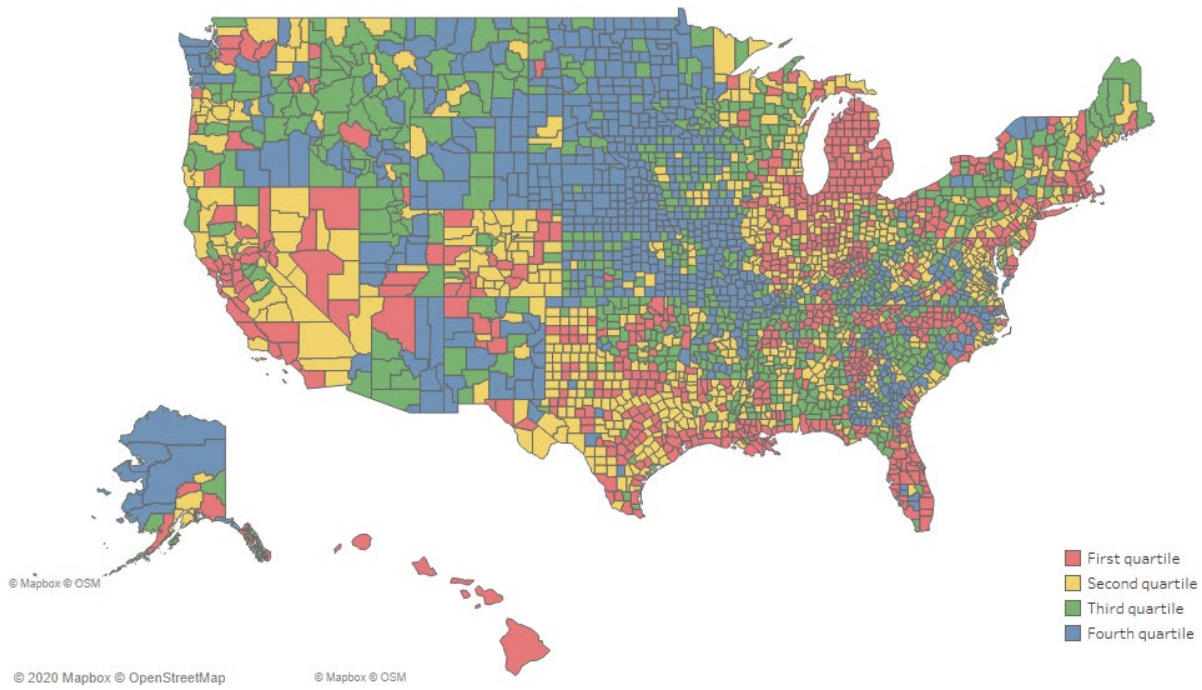
Source: USDA, Economic Research Service (ERS) forecasted estimates using data from the National Establishment Time Series, the Bureau of Labor Statistics, and using data from ERS's Food Expenditure Series.

Figure 6 shows our projected growth in all food sales, FAH sales, and FAFH sales using the midpoint scenario in comparison to the actual change in growth captured by FES. For FAH, only 1 percent of the increase in growth of FAH sales was caused by the recessionary effects of COVID-19 compared to the 3.5-percent total increase in growth of FAH sales (fig. 6). For FAFH sales, only a 0.9-percent decrease in growth was caused by the recessionary effects of COVID-19 compared to the 23-percent total decrease in growth of FAFH sales. The contrast shows that the income shock was not the primary driver of food sales change caused by COVID-19 (fig.6).

Figure 7 shows the projected growth in all food sales for each county in the U.S. using the midpoint scenario. Most counties will experience a significant decline in the growth rate of FAH and FAFH spending. However, the magnitude of the change varies by location as seen on the broad spectrum of color changes. One notable regional pattern is that most of the northern Great Plains is in the fourth quartile, the largest increase, shown in blue. This figure identifies the food sales in counties most likely to be affected by the COVID-19 recession.

Figure 7

**Projected change in the growth of all food sales because of COVID-19 recession**



Note: First quartile are counties that will experience the largest decrease in the growth of food sales (<-0.1 percentage points); second quartile are those counties with an increase in growth of food sales between -0.1 and 0.3; third quartile are those counties with an increase in growth of food sales between 0.3 and 0.5; fourth quartile are those counties with an increase in growth of food sales between 0.5 and 2.8.

Source: USDA, Economic Research Service forecasted estimates using data from the National Establishment Time Series and the Bureau of Labor Statistics.

## Discussion

We projected the change in food sales caused by the COVID-19 recession under three possible scenarios:

- Optimistic: we used the first 3-month average of 2020 for annual employment data, assuming a quick rebound in employment;
- Pessimistic: we used the June employment for the whole of 2020 and assume a slow rebound; and,
- Midpoint: we used the average employment numbers between the optimistic and pessimistic scenarios.

We showed that on average, the growth rate of all food spending will experience between a 0.3 and 0.1 percentage point increase (optimistic and pessimistic scenarios) caused by changes in household food spending decisions stemming from the economic shock of COVID-19. Furthermore, we showed that the growth rate of FAH is projected to increase between 0.9 and 1.1 percentage points, and the growth of FAFH is projected to decrease between 0.8 and 1.1 percentage points because of the COVID-19 economic shock. When we looked at traditional supermarkets versus other FAH stores, the projected decrease is higher for supermarkets than for other FAH stores, which may be partly because of the substitution towards purchasing groceries at other retailers that sell in bulk and are usually less expensive than one's local grocery store. Similarly, we found that the projected change for limited-service restaurants is smaller than for sit-down restaurants, which may be partly because limited-service restaurants are less expensive. Using data from the 2012 Economic Census, we estimated the average cost of a meal in a sit-down restaurant is 2.2 times higher than in a limited-service restaurant. With the three scenarios, the optimistic and pessimistic scenarios presented the likely upper and lower bounds on the magnitudes of change in food sales caused by the COVID-19 income shock. One limitation of this project is that we cannot not capture seasonal substitution effects as we are forecasting annual changes that stem from the income shock of COVID-19.

Our study uses historical data to estimate the change in food, FAH, and FAFH sales growth caused by the income shock of the COVID-19 recession. However, the pandemic nature of COVID-19 has also led to the shutdowns of restaurants, restrictions on movement, and reduced purchases by consumers. Our study provides a comparison of both the pandemic and recession effects of COVID-19 on food sales. We show that the recession was only responsible for a 1-percent increase compared to the total 3.5-percent increase in FAH sales and only 0.9-percent decrease compared to the total 23-percent decrease in FAFH sales. These results highlight that the recessionary income shocks from COVID-19 did not lead to significant changes in the growth of food sales compared to the pandemic effects of COVID-19.

Finally, recent studies have raised concerns about the accuracy of estimates derived from NETS for certain research applications as 80 percent of sales figures in NETS are imputed. Although the use of NETS might be a limitation of the study, we think that our application of NETS data for this study is not as affected by concerns from data imputation. The results of this study will provide some insights into the local economic impacts of COVID-19 on food, FAH, and FAFH spending growth.



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