Understanding the Components of U.S. Food Expenditures During Recessionary and Non-Recessionary Periods

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Abstract

According to the U.S. Department of Agriculture, Economic Research Service's *Food Expenditure Series,* total spending on food and beverages in the United States reached $1.8 trillion in 2019. While real per capita total food expenditures steadily increased through the decades, the share of expenditures at food-at-home (FAH) establishments decreased from 1997 until 2019 and then increased abruptly in 2020. To better understand changes in food spending and its composition during 1997–2020, this study utilizes a structural decomposition analysis. The analysis compares: the roles of variations in aggregate income, propensity to spend versus to save, propensity to spend on food versus non-food, and substitution between FAH and food away from home (FAFH) during non-recessionary periods. These periods include the Great Recession (December 2007 to June 2009) and the Coronavirus (COVID-19) Recession (February to April 2020).

Keywords: Food Expenditure Series, FES, food at home, food away from home, FAH, FAFH, Personal Consumption Expenditures, PCE, Disposable Personal Income, DPI, food spending, recession, COVID-19.

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Understanding the Components of U.S. Food Expenditures During Recessionary and Non-Recessionary Periods

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What Is the Issue?

According to the U.S. Department of Agriculture, Economic Research Service's (USDA, ERS) *Food Expenditure Series,* total spending on food and beverages in the United States reached $1.8 trillion in 2019. This expenditure includes spending at food-at-home (FAH) establishments—grocery stores, supercenters, convenience stores, and other retailers—and food-away-from-home (FAFH) establishments—restaurants, school cafeterias, sports venues, and other eating places. While real per capita total food expenditures increased steadily through the decades, the share of expenditures at FAH establishments decreased from about 53 percent in 1997 to 48 percent in 2019 but then increased to 56 percent in 2020. Previous research has highlighted the roles of rising incomes, lower saving rates, and behavioral changes in U.S. consumer spending. The framework used in this study brings together variations in aggregate income, the propensity to spend versus to save, the propensity to spend on food versus non-food, and the substitution between FAH and FAFH to better understand changes in food spending.

What Did the Study Find?

Prior to 2020, total food expenditures had been increasing for two decades:

- After adjusting for inflation, total food expenditures per capita in 2019 were up 25.2 percent since 1997, rising each year except for the recession years of 2008 and 2009. By contrast, total food expenditures per capita in 2020 were down 8.8 percent compared with 2019.

- Expenditures at FAH establishments and FAFH establishments trended upward from 1997 until 2019.

  - Over this time period, FAH and FAFH expenditures per capita increased by 16.1 percent and 38.4 percent, respectively.

  - The annual share of FAFH expenditures was 51.6 percent in 2019, up from 47.3 percent in 1997.
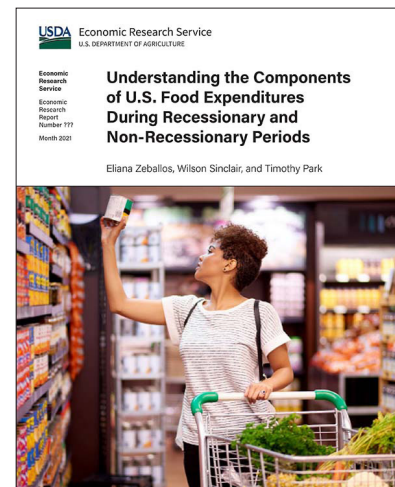
ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

- Prior to 2020, economic recessions generally had less impact on FAH spending than on FAFH spending, as substitution towards more cost-efficient spending at FAH establishments is common in times of reduced income. During the Great Recession, FAH spending per capita declined by 5.7 percent from 2007 to 2009. FAFH spending declined by 8.2 percent from 2007 to 2009.

- In contrast to prior recessions, the recession caused by the Coronavirus (COVID-19) pandemic resulted from an unprecedented combination of changes related to the pandemic. Not only was this period distinguished by restrictions on mobility and FAFH establishments, but disposable income increased, due in part to increased Government social benefits paid to individuals in 2020 (e.g., unemployment insurance and stimulus payments to households).[1] As a result:[1]

  - FAH spending increased by 4.3 percent in 2020. FAFH spending declined by 21.0 percent in 2020.

Results from the structural decomposition reveal the relative contributions of trend components to U.S. food spending changes during non-recessionary periods, as well as during the Great Recession, and the COVID-19 Recession:

- During non-recessionary periods, increased disposable personal income accounted for the largest share of growth in both FAH and FAFH, though the contribution of income was lower after the Great Recession than before. This positive contribution to the growth of FAH spending was partially offset by a shift from spending on FAH to spending on FAFH, as well as by the propensity to spend on food (versus non-food) before the Great Recession.

- During the Great Recession, the decline in disposable personal income contributed to waning FAH and FAFH spending. However, a decline in both the propensity to spend versus save—and in the propensity to spend on food versus non-food—contributed just as much. These components may reflect an inability of households to economize in other parts of the budget, such as rent.

- In contrast, total food expenditures fell, but FAH spending increased during and in the aftermath of the COVID-19 Recession. Although the economy entered a recession, disposable personal income increased (in part due to financial transfers from the Government to households), contributing positively to FAH and FAFH spending. The average decline in the propensity to spend versus save—and the average decline in the propensity to spend on food versus non-food—contributed negatively to FAH and FAFH spending. The substitution towards FAH and away from FAFH decreased FAFH spending dramatically, reflecting the restrictions on mobility and the restrictions on restaurants.

How Was the Study Conducted?

To examine changes in food spending, this study's framework separated food spending into four components: disposable personal income (DPI) (i.e., income effect); personal consumption expenditures (PCE) as a share of DPI (i.e., propensity to spend versus save); total food spending as a share of PCE (i.e., propensity to spend on food versus non-food); and FAH as a share of total food spending (i.e., substitution between FAFH and FAFH). Using data from 1997 to 2020, this study compared the contributions of these components of food spending during non-recessionary periods, the Great Recession (December 2007 to June 2009), and the COVID-19 Recession (February to April 2020). This report also used the monthly *Food Expenditure Series (FES)* created by the USDA, Economic Research Service (ERS), which is a unique dataset that measures the value of the U.S. food system over time by month. In addition, this report used aggregate measures of DPI and PCE from the Bureau of Economic Analysis. All variables are seasonally adjusted in constant 2020 prices. Finally, this report used the consumer price index (CPI) for all items to deflate DPI and PCE, CPI for FAH to deflate FAH spending, and CPI for FAFH to deflate FAFH spending.

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[1]The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) is an economic stimulus bill passed by the 116th U.S. Congress and signed into law on March 27, 2020. The Act came in response to the economic fallout of the COVID-19 pandemic in the United States.

Understanding the Components of U.S. Food Expenditures During Recessionary and Non-Recessionary Periods

Introduction

The United States' total food and beverage expenditures steadily increased over the last two decades. Annual expenditures increased each year except in 2009—during the Great Recession and in 2020—during the COVID-19 Recession. Total food expenditures per capita increased by approximately 27 percent, from $4,144 in 1997 to $5,248 in 2019 (seasonally adjusted in constant 2020 prices). Food expenditures increased for both food-at-home (FAH) establishments—grocery stores, supercenters, convenience stores, and other retailers—and food-away-from-home (FAFH) establishments—restaurants, school cafeterias, sports venues, and other eating places. While expenditures for each type of food establishment trended upward over the past two decades, the share of total expenditures has generally trended more towards FAFH establishments. The share of FAFH increased from 47.3 percent in 1997 to 51.6 percent in 2019.

Previous research has highlighted the links between rising incomes, lower saving rates, and behavioral changes in U.S. consumer spending. Standard economic theory has suggested that a decrease in individual's income translates into lower spending on normal goods, leading to less demand for goods and services (i.e., the income effect). The income effect can be defined as a change in demand caused by a change in real income. Food spending is also susceptible to the income effect. However, food is a basic human need, and there are various ways to obtain food, with a similar variation of cost efficiencies. For example, a household experiencing an income loss will increase shopping time to find bargains, increase time devoted to food preparation, or substitute name brand products for generic products (Nevo and Wong, 2019; Kaplan and Menzio, 2015). During the Great Recession and through the recovery, households shifted some expenditures from FAFH to FAH by increasing spending on edible and unprepared ingredients, while decreasing spending on full-service restaurants (Saksena et al., 2018). These practices have allowed individuals and households to maintain similar calorie intakes and to decrease their overall food expenditures.

The framework used in this study brings together an aggregate variation of the income effect—as well as changes to the propensity to spend versus save, propensity to spend on food versus non-food, and the substitution between FAH and FAFH to examine changes in food spending. To analyze how these four underlying components are associated with food expenditures, this study conducted a structural decomposition analysis (SDA). The SDA framework has supported the study of variations and interactions between components across time. The framework is characterized by both structural income shocks—as well as aggregate shocks during recessionary periods, compared with non-recessionary periods.

This report can contribute to the literature in three ways. First, this study brings together variations in aggregate income and spending behavior as components of aggregate food expenditure in the United States across more than 20 years. Second, this study analyzed the food expenditure response during and in the aftermath of the COVID-19 Recession—a period of time characterized by heightened economic and health uncertainty, precautionary behavioral responses from consumers, restrictions on FAFH establishments for parts of 2020, and reduced mobility that influenced changes in food expenditure composition. Finally, the framework used in this study allows for the assessment of the roles of disposable income, the propensity to spend versus save, the propensity to spend on food versus non-food, and the substitution between FAH and FAFH, all in one framework. Specifically, using data from 1997 to 2020, this study assessed the relative contributions of these components of food spending during non-recessionary periods, the Great Recession, and the COVID-19 Recession.

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Methodology

Researchers have previously attempted to explain changes in food spending in terms of changes in preferences, income, and prices, among other factors. To construct our framework, we examined how aggregate money is generally allocated to food within the economy. Specifically, individuals earn income. After paying applicable income taxes, individuals are free to spend or save what is left, which is called disposable personal income (DPI). The money that is spent and not saved can be devoted to interest payments, transfer payments, and/or to consuming goods and services, which are personal consumption expenditures (PCE). PCE can be devoted to food or non-food transactions, and food expenditures can take place at either FAH or FAFH establishments.

The framework used in this study has allowed the decomposition of an overall change in FAH and FAFH spending into four specific economic components: 1) DPI (i.e., income effect); 2) PCE as a share of DPI (i.e., propensity to spend versus save); 3) total food spending as a share of PCE (i.e., propensity to spend on food versus non-food); and 4) FAH or FAFH as a share of total food spending (i.e., substitution between FAH and FAFH) (figure 1).

Figure 1

Components of food-at-home (FAH) and food-away-from-home (FAFH) expenditures
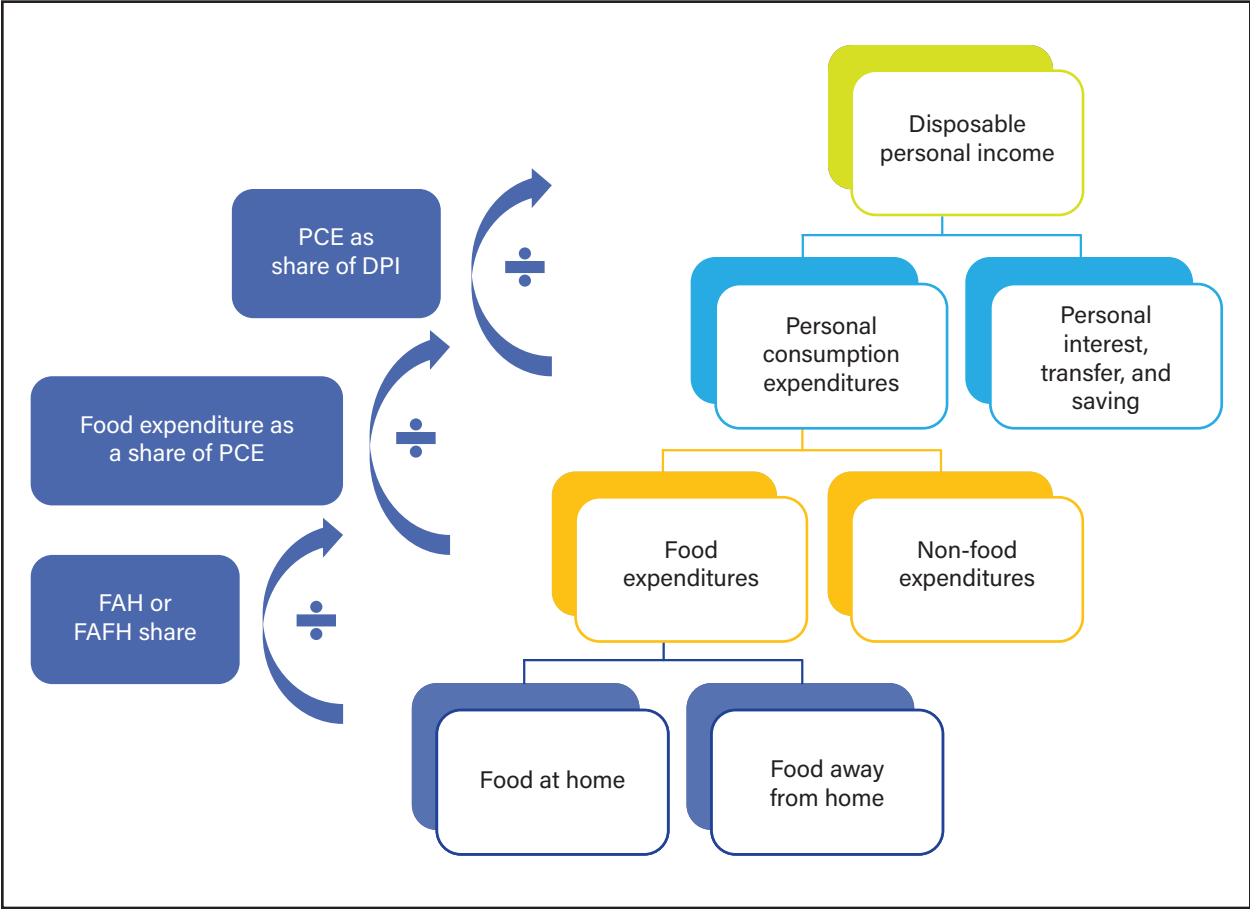
Notes: PCE = personal consumption expenditures; DPI = disposable personal income; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service.

To analyze how these four underlying components affect food expenditures, this report utilized a structural decomposition analysis (SDA). The SDA is a comparative-static method of decomposing the change in one variable into several factors that are pre-defined (Rormose, 2010). This framework can examine variations in the different components and interactions between the different components over an extended time frame, which includes both recessionary and non-recessionary periods. Although each of these shifts is an endogenous function of the "deep parameters,"[2] the structural decomposition analysis usefully assesses the relative importance of various factors contributing to changes in an economic aggregate, such as food spending. For more details, see the appendix.

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[2]We are interested in the links between changes in the different components and measuring the association of these links to FAH and FAFH spending, but we do not attribute causation.

Data

Table 1 provides a short description of each component and summarizes the data from each component. We also compare four periods: 1) from January 1998 to November 2007; 2) July 2009—or post-Great Recession—until January 2020; 3) the Great Recession (December 2007 to June 2009); and 4) the COVID-19 Recession (February to April 2020) and the rest of 2020. To examine food spending trends, this report focused on year-to-year monthly percent changes from 1997 to 2020.[3] All variables were seasonally adjusted and adjusted to constant 2020 prices. This report used the Consumer Price Index (CPI) for all items in an average U.S. city for all urban consumers, seasonally adjusted to deflate disposable personal income (DPI) and personal consumption expenditures (PCE). This report also used the CPI for FAH in an average U.S. city for all urban consumers, seasonally adjusted to deflate FAH spending and used the CPI for FAFH in an average U.S. city for all urban consumers, seasonally adjusted to deflate FAFH spending. Finally, all variables are converted to per capita terms to account for population growth.

Table 1
Summary of the food-at-home (FAH) and food-away-from-home (FAFH) components

Component	Data set - source	Description	Deflator
Disposable personal income (DPI)	U.S. Department of Commerce, Bureau of Economic Analysis	The amount of money that households have available for spending and saving after income taxes	All-items consumer price index (CPI) CUUR0000SA0
Personal consumption expenditures (PCE)	U.S. Department of Commerce, Bureau of Economic Analysis	Value of consumer spending on all goods and services.	All-items CPI CUUR0000SA0
Total food expenditures (TFE)	USDA, Economic Research Service (ERS) *Food Expenditure Series (FES)*	Value of the total food acquired in the United States.	FAH CPI CUSR0000SAF11 FAFH CPI CUSR0000SEFV
Food at home (FAH) and food away from home (FAFH)	USDA, ERS *Food Expenditure Series (FES)*	Value of the food acquired at food-at-home and food-away-from-home establishments in the United States	

Source: USDA, Economic Research Service

Disposable Personal Income

Disposable Personal Income (DPI) is the amount of money an individual takes home, after taxes, to spend and save. As nominal wages have increased and taxes remain proportional to wages, DPI gradually increased over time in the United States—real monthly DPI per capita increased 45.6 percent from 1997 to 2020. DPI can be relatively resilient to economic recessions in part the result of increased Federal transfers during economic downturns to compensate for the reduction in aggregate income. Since 1997, the only instances of 3 consecutive months of declining DPI per capita were recorded in 2005, during the Great Recession (GR), and in 2013.[4] The GR saw an average year-to-year, monthly decrease of the DPI of 0.8 percent, compared

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[3]The U.S. Census Bureau's Economic Census—one of the major sources of data for the *Food Expenditure Series*—began using the North American Industry Classification (NAIC) System in 1997 (Okrent et al., 2018), which is where this report's data analysis begins.

[4]Numerous tax cuts enacted between 2001 and 2010 were scheduled to expire after 2012. Congress enacted the American Taxpayer Relief Act of 2012 (ATRA) on January 1, 2013, to prevent most of the sunsetting tax cuts from expiring. Most 2001- and 2003-income tax cuts were made permanent for all but the highest income taxpayers. This may explain the decrease in DPI, as a result of the slight increase in the tax rate from 2012 to 2013, in the aggregate.

with an increase of 1.8 percent from 1998 to November 2007 and a 1.5-percent increase from July 2009 to January 2020. During the COVID-19 Recession, on average, DPI experienced one of the highest increases in the past decades at 5.7 percent year-to-year, monthly growth, and at 5.6 percent during the rest of 2020, likely driven by the stimulus packages provided by the Federal Government (figure 2).

Personal consumption expenditures

Personal consumption expenditures (PCE) is a measure of all the goods and services purchased by households in the United States. PCE estimates come from statistics from the U.S. Department of Commerce, Bureau of the Census and other Government agencies, administrative and regulatory agency reports, and trade association reports. PCE mostly comprised purchases of new goods and services by households. However, PCE also included purchases from Government enterprises, nonprofit institutions, and purchases of goods and services by U.S. residents while abroad, among others. Like other measures of spending, real PCE experienced a generally upward trend over the past few decades, with recessions having a significant impact on the amount of money individuals are spending. After adjusting for inflation and seasonality, on average, the year-to-year percent change of monthly PCE per capita was 2.1 percent from January 1998 to November 2007 (pre-GR period). Similarly, the year-to-year percent change of monthly PCE was 1.4 percent from July 2009 to January 2020, on average (post GR period). The average year-to-year percent change of monthly PCE fell by 2.1 percent during the GR and declined 6.9 percent during the COVID-19 Recession and 4.3 percent during the rest of 2020 (figure 2).

Figure 2

U.S. personal consumption expenditures and disposable personal income trended upward for over two decades, January 1997–December 2020 by month
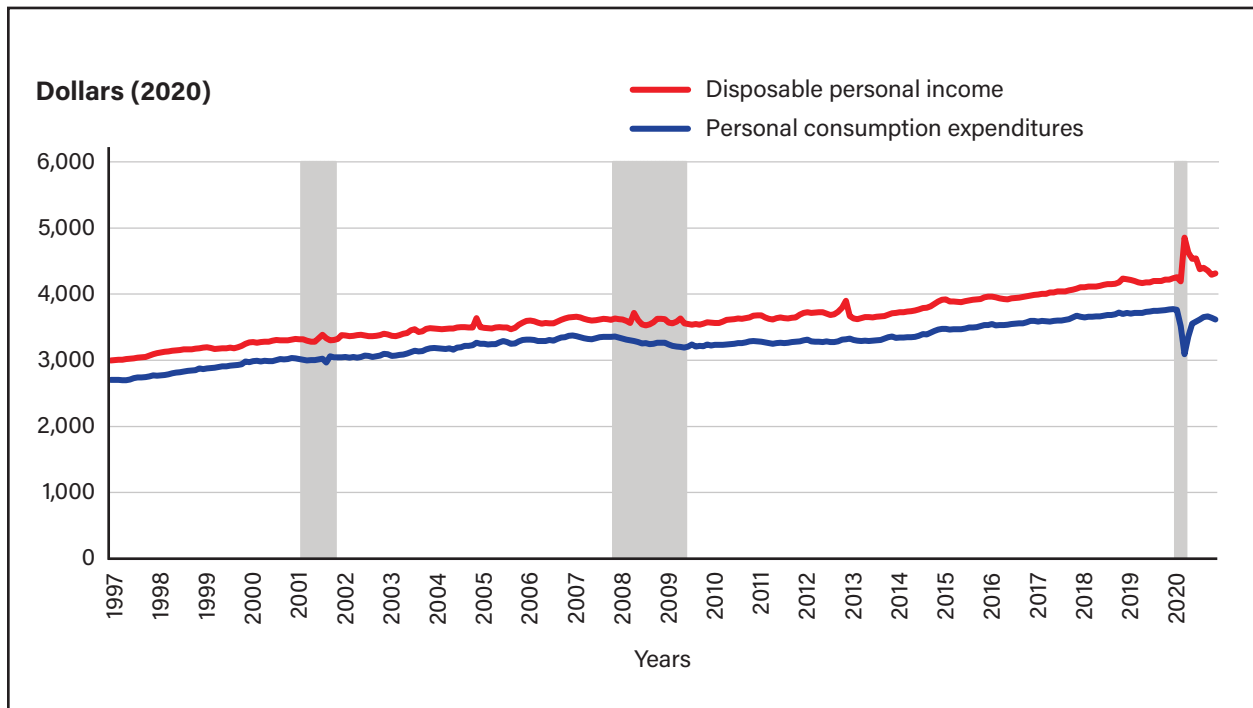
Notes: Constant dollar sales (2020=100). Seasonally adjusted in per capita terms. Recession periods are noted in gray.

Source: USDA, Economic Research Service using data from the U.S. Department of Commerce, Bureau of Economic Analysis.

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Food-at-home and food-away-from-home spending

We used monthly food-at-home (FAH) and food-away-from-home (FAFH) expenditure data from USDA, ERS's *Food Expenditure Series (FES)* from 1997 to 2020. FES uses data from the U.S. Department of Commerce, Bureau of the Census' Economic Census, monthly and annual surveys, other U.S. statistical agencies, and trade associations to produce monthly and annual outputs describing the U.S. food system over time.

FES presents—in several ways—the total value of food and beverage acquisitions. FES enables the analysis of expenditures by 1) type of product (food and alcohol for off- and on-premises consumption); 2) outlet type (grocery stores, full-service restaurants, hotels and motels, etc.); 3) final purchasers (e.g., individuals/households, Government, businesses, and nonprofit organizations); and 4) individual/household final users (on a per household basis and as a share of DPI). Moreover, the FES collects not only food purchase data but also food acquisitions—food produced at home, food furnished as an ancillary activity, and Government donation programs (Okrent et al., 2018).

The most general level of disaggregation in FES is the distinction between FAH and FAFH expenditures. FAH spending is any food expenditure that consumers will bring home to prepare and consume, whereas FAFH spending is any food expenditure that individuals consume outside of the home (at locations such as restaurants). Most FAH expenditures occur at grocery stores (but can also include supercenters, convenience stores, and other FAH retailers such as farmers' markets, bakeries, etc.). The majority of FAFH spending is at either full-service or limited-service restaurants. FAFH also occurs at cafeterias, sports venues, and other eating places. Historically, more than 80 percent of all U.S. food expenditures are purchased by households rather than by businesses or the Government.

FES allows Government agencies, academics, policymakers, food manufacturers and retailers, and the public to gauge and track developments in consumers' food acquisitions and the food supply. FES is also useful for evaluating changes in food spending and the changing composition of food marketing systems over time.

After adjusting for inflation, total food expenditures per capita in 2019 were up 26.6 percent since 1997, with year-to-year increases in most years, except for 2008 and 2009 during the Great Recession. Total food expenditures experienced a decrease of 8.8 percent in 2020. Expenditures on FAFH establishments (red line in figure 3), as well as the share of FAFH spending (figure 4b), trended upward from 1997 until 2019. The annual share of food expenditures on FAFH was 51.6 percent in 2019, up from 47.3 percent in 1997 (figure 4b). The increased share of FAFH can be explained by efficiencies in the U.S. food system, which kept inflation for FAH prices generally low. In addition, FAH accounted for a smaller share of food expenditures, which allowed an increase in FAFH expenditures, which are generally more expensive than FAH. However, FAH expenditures have also increased since 1997 but at a lower rate. This increase in FAH spending could reflect more expensive U.S. consumer purchases at grocery stores—such as pre-cut produce, imported out-of-season foods, organic products, and prepared dishes.

Recessions and economic uncertainty have impacted consumers spending behaviors. During the Great Recession that lasted from December 2007 to June 2009, total food spending declined by 2.5 percent and 4.5 percent in 2008 and 2009, respectively. Economic recessions generally had less impact on FAH spending than on FAFH spending. Historically, consumers commonly engage in more cost-efficient spending at FAH establishments in times of reduced income (Kaplan and Menzio, 2015; Nevo and Wong, 2019). As such, FAH spending declined by 2.6 and 3.3 percent in 2008 and 2009, respectively, while FAFH spending declined by 2.5 percent and 5.8 percent in 2008 and 2009, respectively. The COVID-19 Recession is different from the previous recessions due to the ongoing pandemic, restrictions in FAFH establishments, and mobility restrictions. As a result, total food spending declined by 8.8 percent in 2020. FAH spending increased 4.3 percent, while FAFH spending plunged—decreasing 21.1 percent in 2020 (figure 3).

Figure 3

U.S. total monthly food, food-at-home, and food-away-from-home spending has increased since 1997, outside of recession years
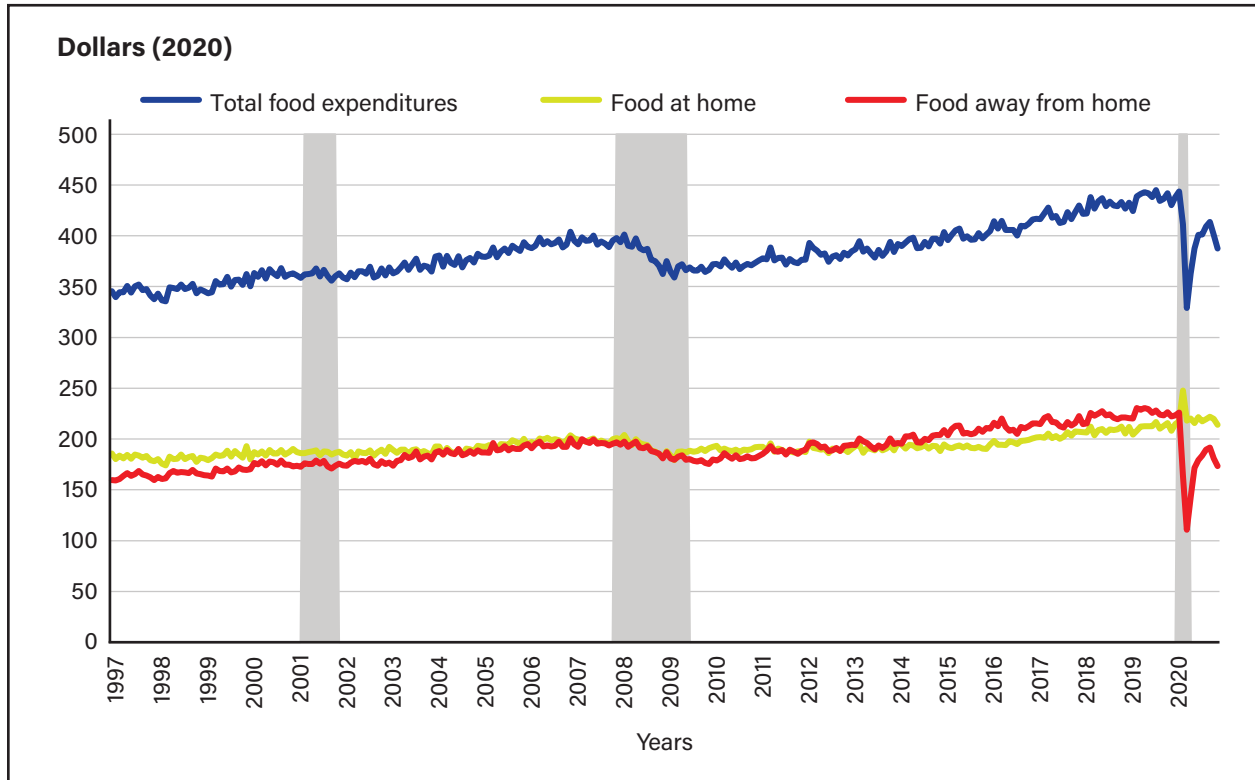
Dollars (2020)

Notes: Constant dollar sales (2020=100). Seasonally adjusted in per capita terms. These monthly food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Recession periods are noted in gray.

Source: USDA, Economic Research Service, *Food Expenditure Series*.

Figure 4

Food-away-from-home share trended upward since 1997, outside of recession years

A. Food at home

Percent

B. Food away from home

Percent

Notes: Constant dollar sales (2020=100). Seasonally adjusted in per capita terms. The years in which at least 3 months are affected by a recession are 2001, 2008, 2009, and 2020. These annual food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions.

Source: USDA, Economic Research Service, *Food Expenditure Series*.

Figure 5 illustrates the share difference of FAH and FAFH expenditures by month. The share of FAH expenditures was lower during the GR of 2007–09 (red line), compared with the share of FAH expenditures before the GR (lime green line), and this is true for every month of the GR. Despite the decline in the share of FAFH expenditures during the GR (figure 4), the share of FAFH expenditures was relatively higher during the GR, compared with levels before the GR. Post-Great Recession (orange line), the share of FAFH expenditures was even higher. This change in the food expenditure composition suggests a shift away from FAH towards FAFH in the aftermath of the GR. However, this trend shifted to increased FAH expenditures during and in the aftermath of the COVID-19 Recession (light and dark blue lines)—as it appears to have generated a precautionary behavioral change (figure 5). However, this shift may have been influenced by the many restrictions on FAFH establishments for parts of 2020.

Figure 5

Average monthly expenditure shares have shifted towards food away from home (FAFH), even during the Great Recession, but reversed in 2020
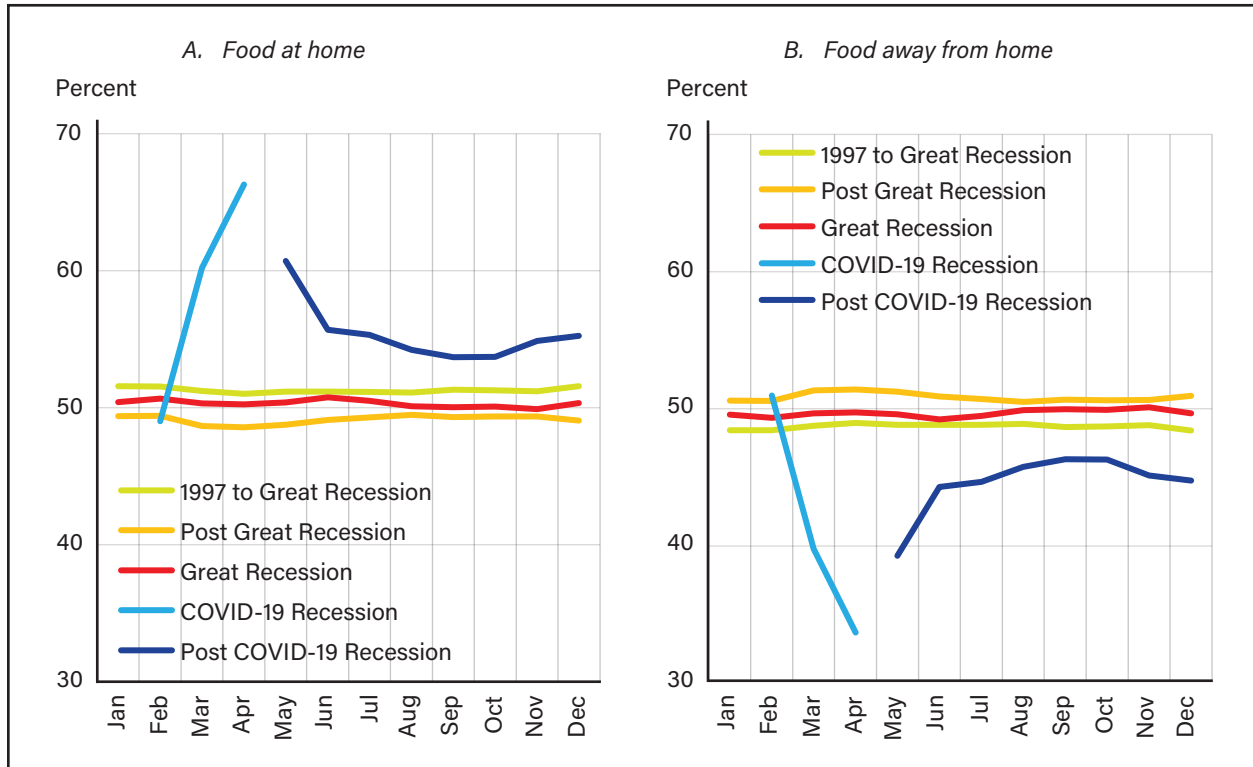
A. Food at home

Percent

- 1997 to Great Recession
- Post Great Recession
- Great Recession
- COVID-19 Recession
- Post COVID-19 Recession

B. Food away from home

Percent

- 1997 to Great Recession
- Post Great Recession
- Great Recession
- COVID-19 Recession
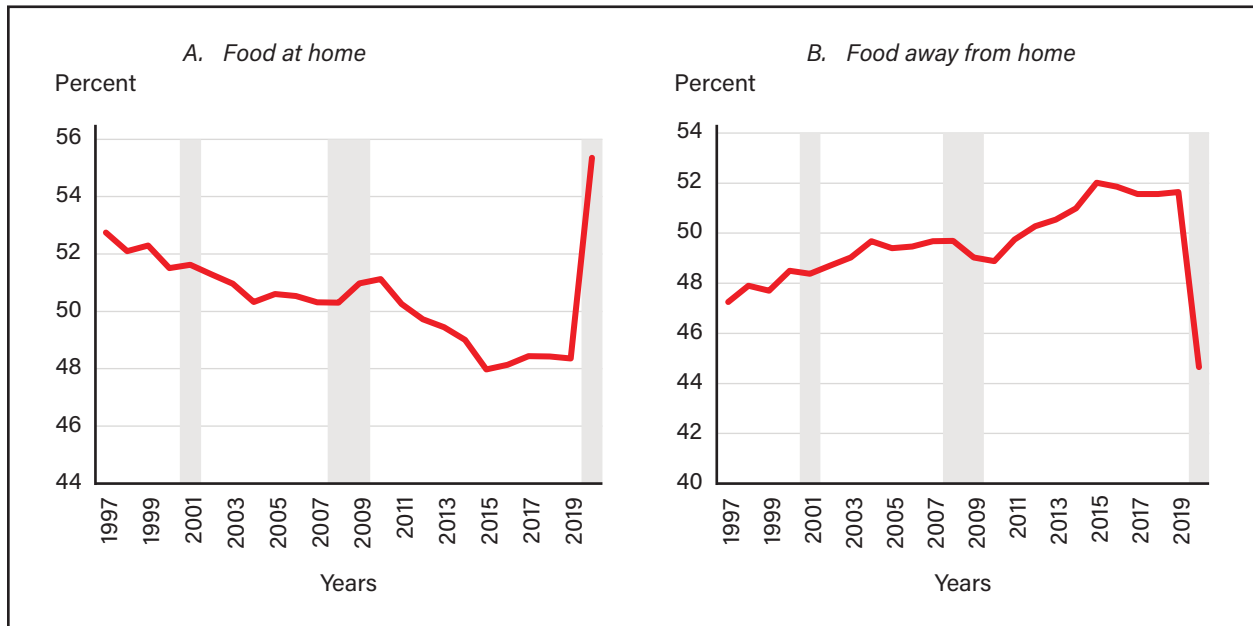- Post COVID-19 Recession

Notes: Constant dollar sales (2020=100). Seasonally adjusted in per capita terms. These monthly food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions.

Source: USDA, Economic Research Service, *Food Expenditure Series*.

Shares

Personal consumption expenditures as a share of disposable personal income (propensity to spend versus save)

Personal consumption expenditures (PCE) comprise approximately 90 percent of disposable personal income (DPI). Therefore, people living in the United States spend most of their disposable income in a discretionary manner. Although this share was more volatile during periods of recession, this share has remained stable since 1997. Recessions tend to decrease this share, perhaps due to increased saving, in response to economic uncertainty. This trend has been especially evident in the COVID-19 Recession. The monthly PCE (as a share of DPI)—or the propensity to spend—had an average, year-to-year, monthly decrease of 1.3 percent during the GR. During the COVID-19 Recession, this share decreased by 11.1 percent and by 9.2 during the rest of 2020 (due to the sharp decline of PCE), despite the increase in DPI (figure 6).

Total food spending as a share of personal consumption expenditures (propensity to spend on food versus non-food)

The share of total food expenditures (TFE) to PCE—or the propensity to spend on food versus non-food—has been relatively consistent since 1997 at approximately 11–12 percent, on average. The average monthly propensity to spend on food versus non-food during the GR of 2007–09 was 11.6 percent, compared with 12.0 percent pre-GR and 11.6 percent post-GR. During the COVID-19 Recession, the TFE share was, on average, 11.4 percent and 11 percent during the rest of 2020. Since PCE was lower during the COVID-19 Recession, total food expenditure was also lower. Although there was a spike in FAH expenditures during the COVID-19 Recession, this spike did not translate into an increase in overall food spending (figures 3 and 6).

Food at home as a share of total food spending

Historically, U.S. consumers have spent more money on FAH than on FAFH, but this disparity has been decreasing over time. This trend reversed in 2012, when looking at the average monthly food expenditures—which excludes food that is furnished and donated, home-produced, and served at educational institutions.[5] In 2019, the average monthly share of food expenditures on FAH was 48.4 percent, compared with the 52.7 percent monthly average in 1997. Economic recessions generally have less of an impact on FAH as a share of total food expenditure. The average monthly share of FAH was essentially constant during the GR—as opposed to its normal, year-to-year monthly gradual decline of -0.5 percent from 1998 to November 2007 and -0.4 percent from July 2009 to January 2020. However, the COVID-19 Recession resulted in a year-to-year increase of the monthly FAH share by 22.1 percent, on average, and by 14.4 percent during the rest of 2020. This increase in the FAH share during and in the aftermath of the COVID-19 Recession may be explained by changes in spending decisions due to social restrictions, reduced mobility, restrictions on FAFH establishments for parts of 2020, and general economic uncertainty. As a result, FAH expenditures accounted for 56.3 percent of total food expenditures, on average, since the COVID-19 Recession started in February and until December 2020 (figure 6). [5]

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[5] In 2019, home production and donations represented less than 0.3 percent of total FAH spending. Food furnished and donated represented 4.9 percent of total FAFH spending. Food served at educational institutions represented 7.3 percent of total FAFH spending.

Figure 6
Component shares are relatively stable outside of a recession
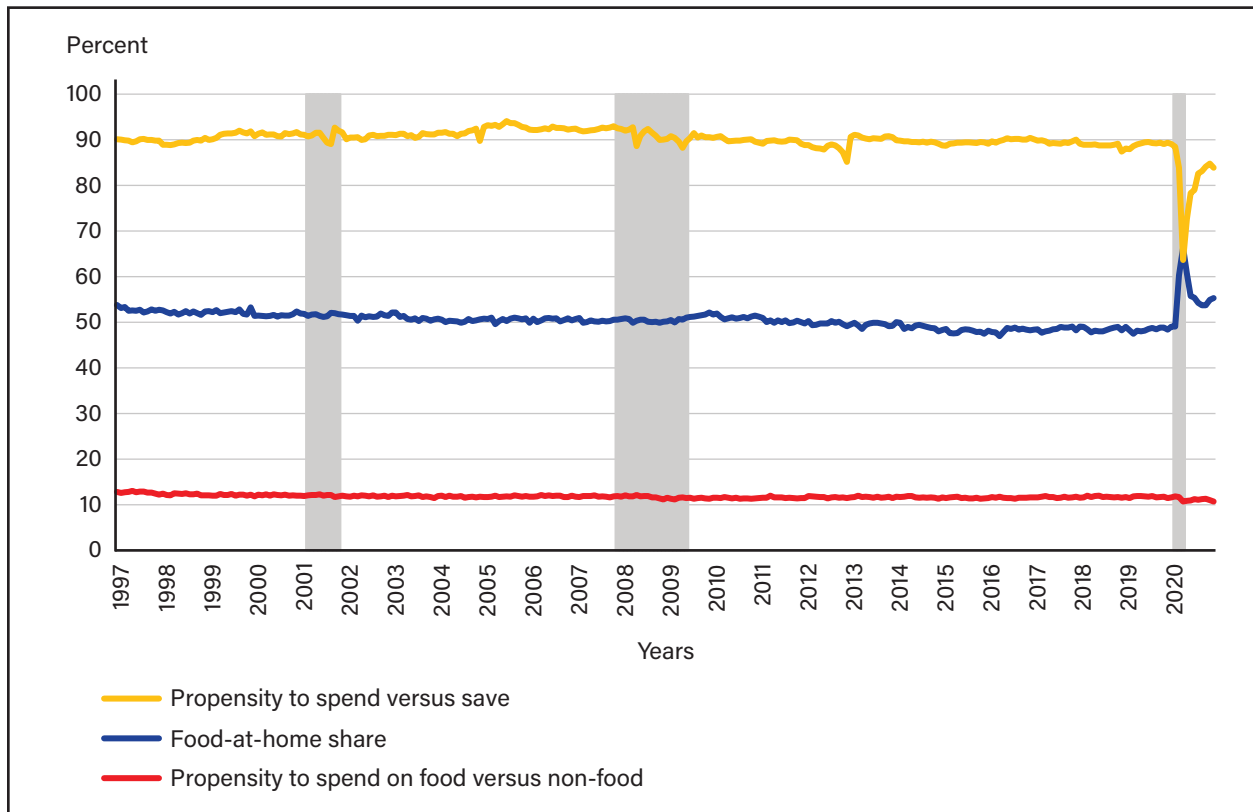
Notes: Constant dollar sales (2020=100). Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Recession periods are noted in gray.

Source: USDA, Economic Research Service, *Food Expenditure Series*; U.S. Department of Commerce, Bureau of Economic Analysis.

Results

This section explores how certain factors contributed to changes in FAH and FAFH expenditures during non-recessionary periods, including the Great Recession and the COVID-19 Recession. These factors include: disposable personal income (DPI) (i.e., income effect); personal consumption expenditures (PCE) as a share of DPI (i.e., propensity to spend versus to save); total food spending as a share of PCE (i.e., propensity to spend on food versus non-food); and FAH or FAFH share of total food spending (i.e., substitution between FAH and FAFH).

Figures 7 and 8 show the contribution each factor made to changes in aggregate FAH and FAFH spending by month from 1998 to 2020. DPI positively contributed to FAH spending in most of the months analyzed. The only periods in which DPI contributed negatively to FAH spending were during the GR, its aftermath, and in 2014 (which could be the result of the declined 2013 DPI). This tendency is illustrated by the light blue bar in figure 7. This positive contribution to FAH spending was partially counterbalanced by changes in two separate components: the propensity to spend on food versus non-food (represented by the dark blue bar); and the substitution between FAH and FAFH (i.e., people shifted away from FAH to FAFH, represented by the orange bar).

FAH spending experienced the sharpest decrease over the period analyzed, following the Great Recession (figure 7). This decrease was largely explained by changes in the propensity to spend on food—represented by the dark blue bar—and by the propensity to spend, represented by the lime green bar (figure 7). In contrast, FAH spending experienced a sharp increase during the COVID-19 Recession and the rest of 2020, which was mostly driven by changes in disposable personal income and by people substituting FAFH towards FAH (due in part to restrictions in FAFH establishments). This increase was partially offset by a decline in the propensity to spend versus the propensity to save and by the propensity to spend on food versus non-food (figure 7).

Figure 7

Changes in aggregate food-at-home spending associated with changes in individual component shares, by month

Notes: Constant dollar sales (2020=100). 12-month moving average, in per capita terms. The red line depicts year-to-year changes in the monthly food-at-home spending. Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Recession periods are noted in gray.

Source: USDA, Economic Research Service, *Food Expenditure Series* and U.S. Department of Commerce, Bureau of Economic Analysis.
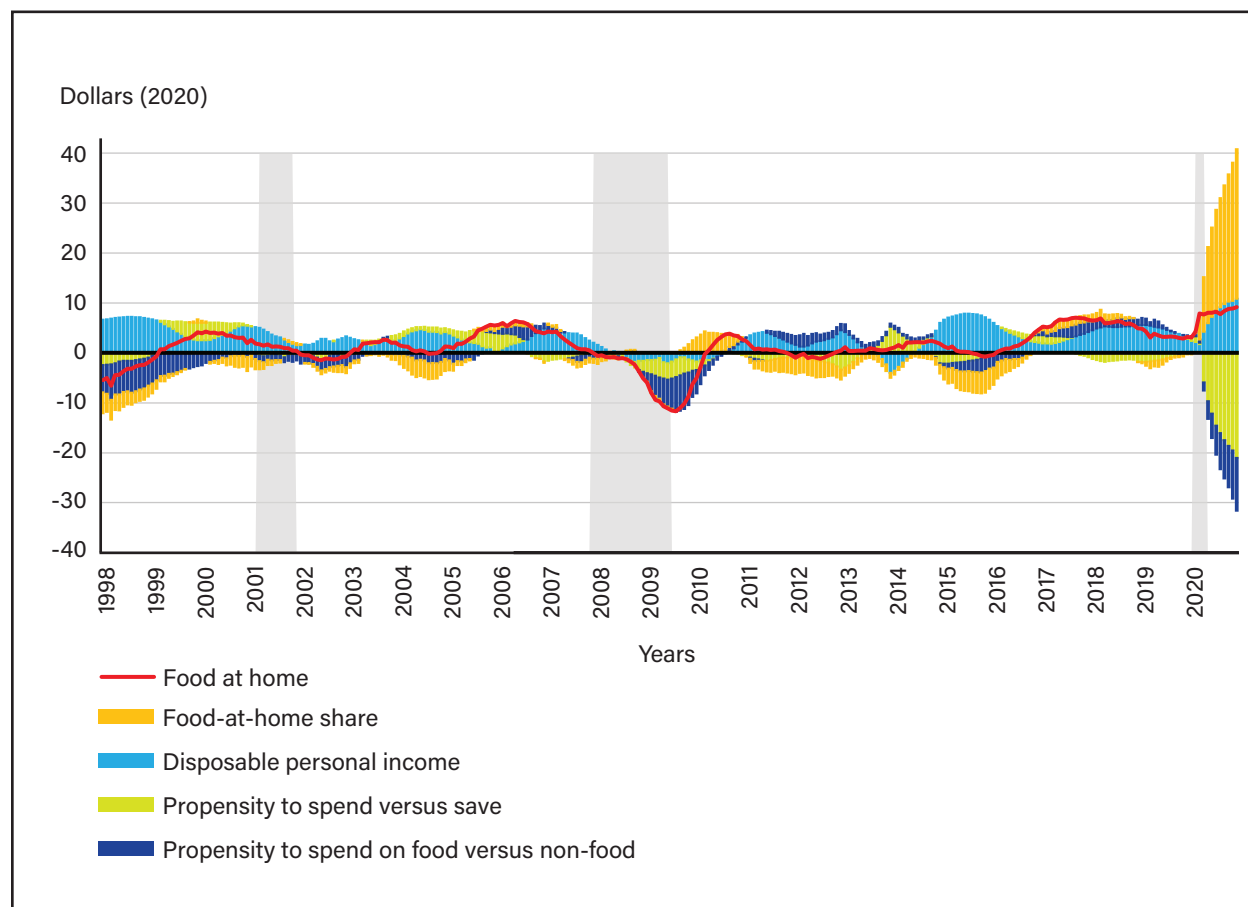
Similarly, DPI positively contributed to FAFH spending in most of the months analyzed (except during the GR, post-GR, and in 2014), shown by the light blue bar in figure 8. This positive contribution to FAFH spending was partially counteracted by changes in the propensity to spend on food (dark blue bar) in more than half of the period analyzed (figure 8). FAFH spending also experienced a sharp decrease in the aftermath of the Great Recession. This decrease was mostly explained by changes in the propensity to spend on food (dark blue bar, figure 8) and the propensity to spend versus to save (lime green bar, figure 8). The sharpest decrease in FAFH spending was experienced during the COVID-19 Recession and the rest of 2020. Although increases in DPI positively contributed to FAFH spending, the other three factors negatively impacted FAFH spending (red line, figure 8). In particular, the shift away from FAFH to FAH spending during the COVID-19 Recession and the remaining months of 2020 contributed the most to the decline in FAFH spending (figure 8) due to mobility restrictions and restaurant closures.

Figure 8

Changes in aggregate food-away-from-home spending associated with changes in individual component shares, by month

Dollars (2020)

Food away from home

Food-away-from-home share

Propensity to spend on food versus non-food

Propensity to spend versus save
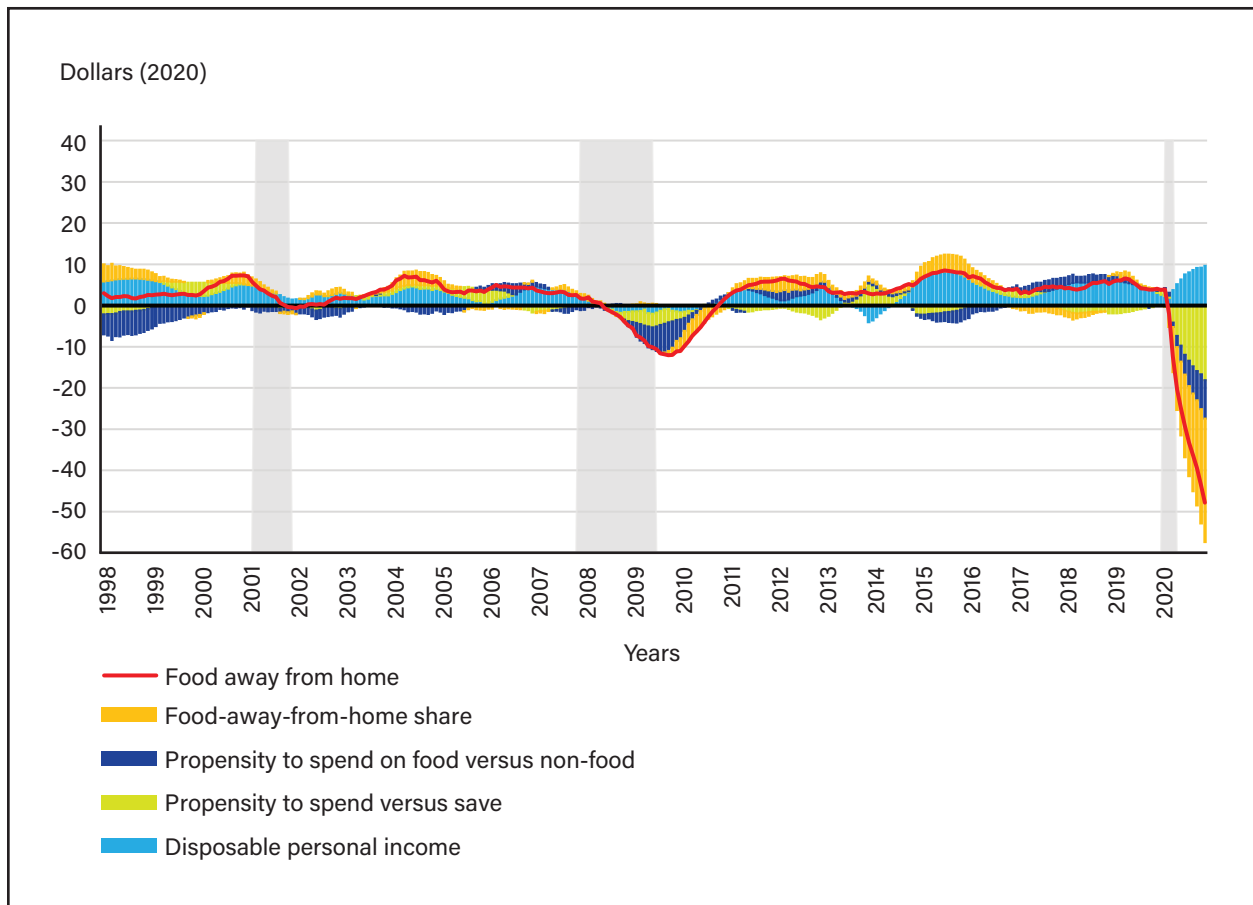
Disposable personal income

Years

Notes: Constant dollar sales (2020=100). 12-month moving average, in per capita terms. The red line depicts year-to-year changes in the monthly food-away-from-home spending. Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Recession periods are noted in gray.

Source: USDA, Economic Research Service, *Food Expenditure Series* and U.S. Department of Commerce, Bureau of Economic Analysis.

Figures 9 and 10 illustrate the relative importance of each component on aggregate FAH and FAFH spending, respectively, by four periods in time: 1) 1997 to Great Recession; 2) during the Great Recession; 3) post-Great Recession; and 4) during the COVID-19 Recession. Since these results capture the relative effects of the four components on FAH and FAFH expenditures, the sum of the four components will be either 100 (when there was an increase in food spending on average) or -100 (when there was a decrease in food spending on average) during the period analyzed.

During non-recessionary periods, changes in DPI represent the highest contributing share to increased aggregate FAH spending, on average. This component is shown by the light blue bar in figure 9. In both periods, this positive contribution to FAH spending was partially counteracted by changes in FAH spending as a share of total food spending, represented by the orange bar in figure 9. The first period from 1998 to the GR, on average, saw total food spending as a share of PCE, which also partially counterbalanced the positive contribution of DPI.

During both the Great Recession and the COVID-19 Recession, two factors contributed negatively to aggregate FAH spending: the propensity to spend versus save (lime green bar, figure 9) and the propensity to spend on food versus non-food (dark blue bar, figure 9). However, during the COVID-19 Recession, this decrease in FAH spending was counteracted by DPI (light blue bar, figure 9) and the shift away from FAFH to FAH (orange bar, figure 9), resulting in an overall increase in FAH spending.

Figure 9
Contribution of each component to changes in aggregate food-at-home spending, by period

Notes: Changes in food-at-home spending are based on constant dollar sales (2020=100) per capita. Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Time periods: 1998 to Great Recession= January 1998 to November 2007; Post Great Recession = July 2009 to January 2020; Great Recession = December 2007 to June 2009; COVID-19 Recession = February 2020 to April 2020.
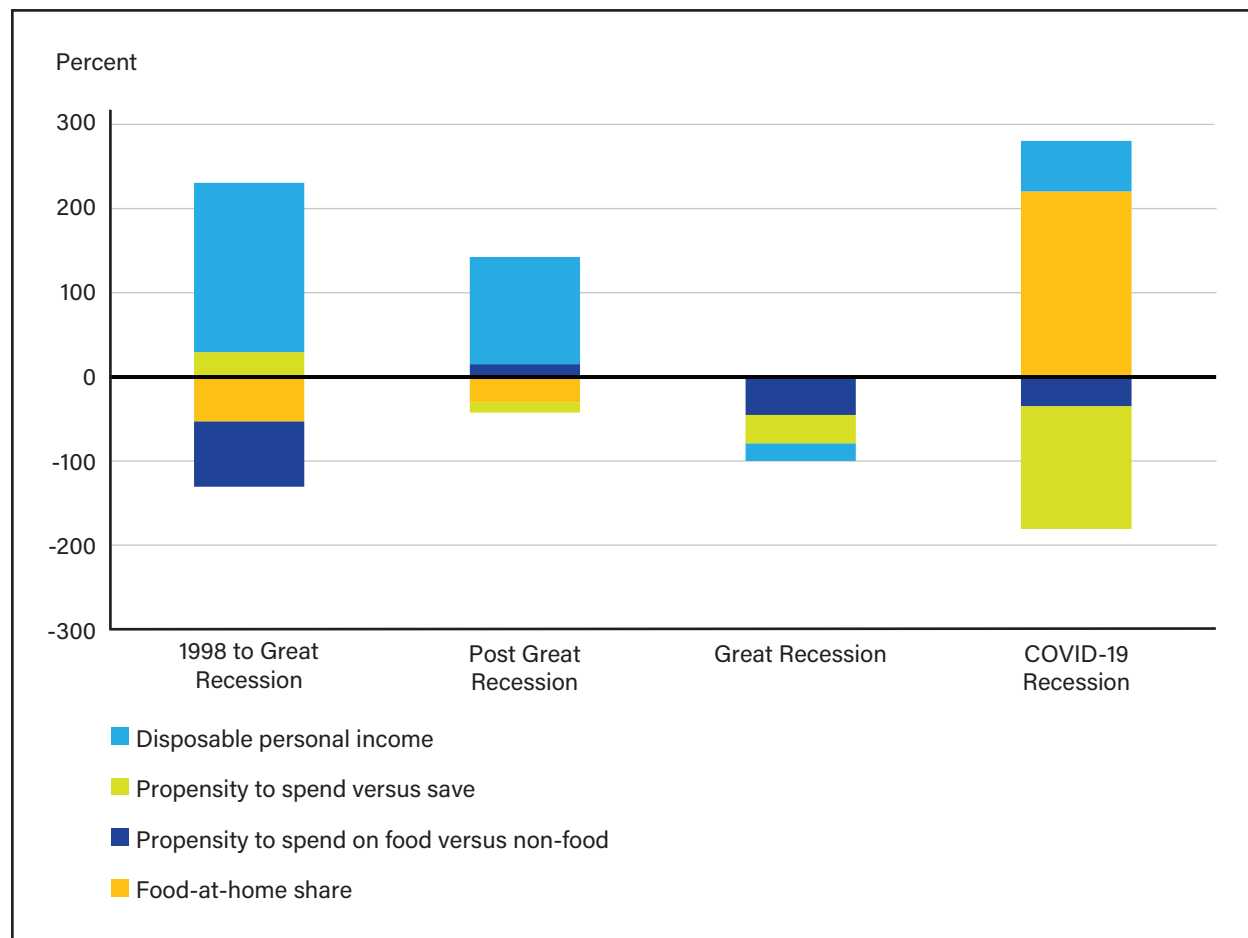
Source: USDA, Economic Research Service, *Food Expenditure Series* and U.S. Department of Commerce, Bureau of Economic Analysis.

During non-recessionary periods, on average, changes in DPI had the highest share contributing to increased aggregate FAFH spending. The first period from 1998 to the GR, on average, saw the propensity to spend on food (dark blue bar, figure 10) partially counterbalance the positive contribution of DPI. The second period from the GR to the COVID-19 Recession, on average, saw the propensity to spend (lime green bar, figure 10) slightly counteract the positive contribution of the other three components.

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Like FAH, on average, two factors are contributing to decreases in aggregate FAFH spending during recessions periods: the propensity to spend on food (dark blue bar, figure 10) and the propensity to spend (lime green bar, figure 10). Though changes in DPI partially counterbalanced this decrease during the COVID-19 Recession, aggregate FAFH was negatively affected by the shift away from FAFH to FAH spending, resulting in the sharpest decrease in aggregate FAFH spending in the past two decades.

Figure 10
Contribution of each component to changes in aggregate food-away-from-home spending, by period
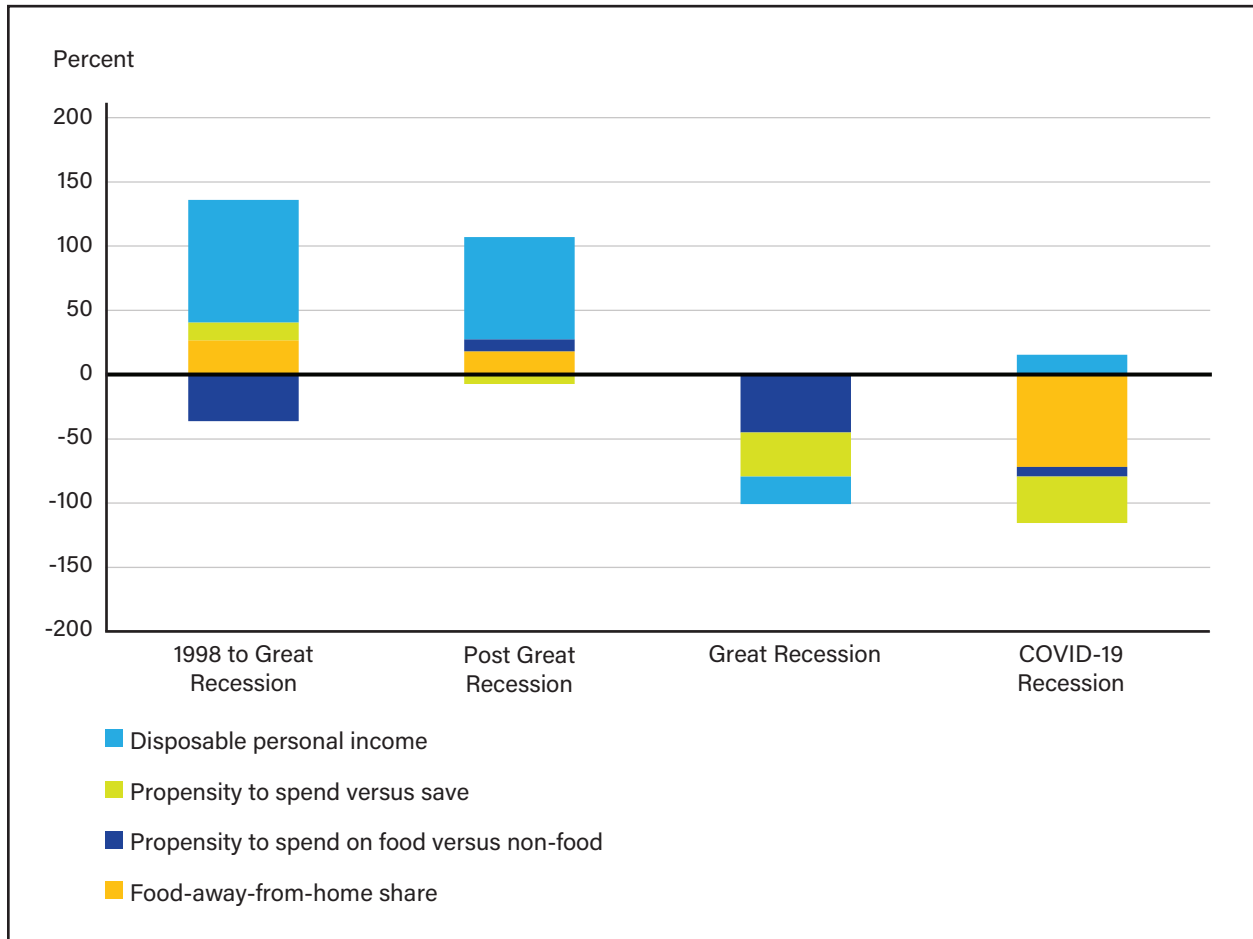

Notes: Changes in food-at-home spending are based on constant dollar sales (2020=100) per capita. Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Time periods: 1998 to Great Recession= January 1998 to November 2007; Post Great Recession = July 2009 to January 2020; Great Recession = December 2007 to June 2009; COVID-19 Recession = February 2020 to April 2020.

Source: USDA, Economic Research Service, *Food Expenditure Series* and U.S. Department of Commerce, Bureau of Economic Analysis.

Discussion

This study decomposed the components of U.S. food-at-home (FAH) and food-away-from-home (FAFH) expenditures from 1997 to 2020, with a focus on the Great Recession and the COVID-19 Recession. The framework used in this study brings together an aggregate variation of the income effect, propensity to spend, propensity to spend on food, and substitution between FAH and FAFH spending. This report conducted a structural decomposition analysis to assess how these four underlying components—and the interaction between these components—affect food expenditures.

Real, per capita expenditures, on both FAH and FAFH establishments. increased from 1997 until 2019, with a lower rate of growth in FAH spending. This resulted in an increased share of FAFH, from 47.3 percent in 1997 to 51.6 percent in 2019. The lower growth rate in FAH spending can be explained partly by efficiencies in the U.S. food system, which kept inflation for FAH prices generally low—even as U.S. consumers may have been making more expensive grocery store purchases, such as pre-cut produce, imported out-of-season foods, and organic products. The fact that FAH spending accounts for a smaller share of food expenditures allows for more consumer funds to buy the generally more expensive FAFH options.

Economic recessions generally had a lesser impact on FAH spending than on FAFH spending, as consumers shifted to more cost-efficient spending at FAH establishments, which is common in times of reduced incomes. Results show this is what happened during the Great Recession—with a decline in both FAH and FAFH but with a lesser negative impact on FAH spending. However, during the COVID-19 Recession and the rest of 2020, FAH spending increased, while FAFH spending experienced the sharpest decrease since 1997. This could be due to the ongoing pandemic, restricted mobility, and restrictions in FAFH establishments for parts of 2020.

Note the structural decomposition is based on an accounting framework for four different components in food expenditures, rather than a behavioral model that could also include prices and the value of consumers' time. FAH and FAFH prices have both steadily increased since 1997. The ratio of the consumer price index (CPI) of food to all-items CPI is around one, which means that both have been following a similar trajectory over time (figure 11). The FAH CPI to FAFH CPI ratio has experienced a decreasing trend, especially after the Great Recession. This means that FAH prices have been increasing at a slightly lower rate than FAFH prices. However, the trajectories of both ratios indicate that FAH and FAFH prices have been following similar trends, which have mirrored those in the overall economy. So, given that we are deflating by the appropriate price index in the main analysis, it is unlikely that the results are driven by price fluctuations in any category. The overall increase in FAFH occurred, despite the increasing cost of FAFH relative to FAH.

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Figure 11
Ratio of consumer price index of food to all-items, consumer price index of food at home to food away from home
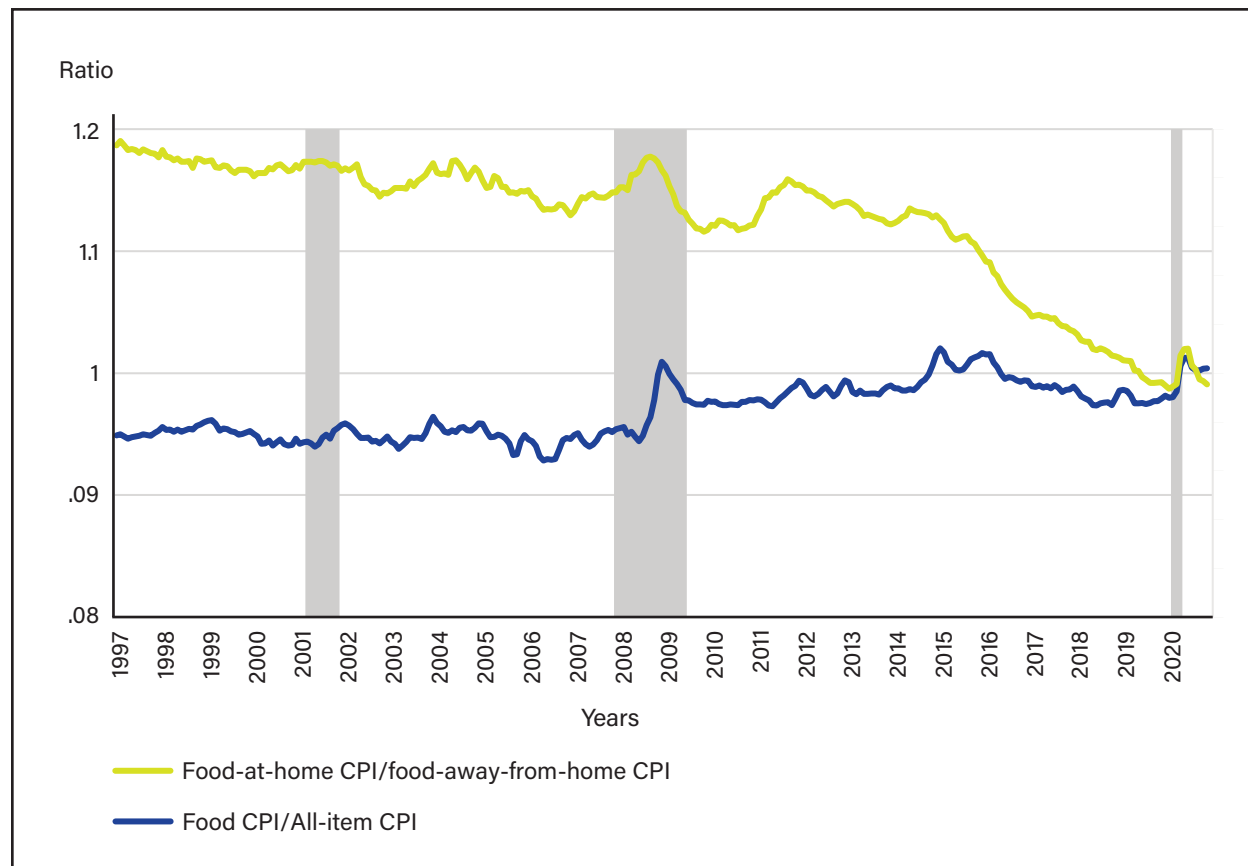
Notes: CPI = consumer price index. (2020=100). Seasonally adjusted. Recession periods are noted in gray.

Source: USDA, Economic Research Service using data from the U.S. Department of Labor, Bureau of Labor Statistics.

Results from the main analysis indicate DPI has a positive relationship with both FAH and FAFH expenditures during non-recessionary periods. Moreover, DPI is the largest contributor to increased food spending in non-recession years, essentially confirming that consumers consider both FAH and FAFH goods and services as normal goods during non-recessionary periods. This positive contribution to FAH spending was partially counteracted by the shift away from FAH towards FAFH spending, which explains the increase in the FAFH expenditure share since 1997. The shift away from FAH towards FAFH spending shows consumers have generally tended to spend more of their food expenditures at FAFH establishments during non-recession years.

During both the GR and the COVID-19 Recession, a decreased propensity to spend, and a decreased propensity to spend on food, contributed to the decrease in FAH and FAFH spending. This decline is perhaps a reflection of economizing during economic uncertainty. During the COVID-19 Recession, policy and health concerns led to significant reductions in consumers' ability or willingness to dine out, and therefore, their ability or willingness to spend money on FAFH. As such, the shift from FAFH to FAH spending is one of the most impactful components of increased FAH spending observed in this analysis. It is interesting to note that, during the GR, the shift away from FAH (towards FAFH) was qualitatively similar to that of non-recession years, only to a lesser degree. This shift signifies the GR only slowed the trend of prominent FAFH spending, rather than reversing it, as it was reversed during the COVID-19 Recession.

Finally, although aggregate income generally decreases during a recessionary period, Government transfers can help counterbalance income shocks. The increase in aggregate DPI—likely driven by stimulus pack-

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ages provided by the Federal Government—boosted both FAH and FAFH spending during the COVID-19 Recession and the rest of 2020, though FAFH experienced an overall sharp decrease since February 2020.

The structural decomposition analysis conducted in this study allowed the comparison of separate components of food expenditure changes in the United States, shedding light on how the food market interacts with the economy in general and in during recessionary periods. In particular, the COVID-19 pandemic has caused substantial changes in the way money is spent on food in the United States, both from behavioral changes (social distancing measures) and economic changes (the recession). It will be important to study how food spending and its composition could change in the post-pandemic landscape as the economy recovers. Given the evolving post-pandemic food market, the composition of food expenditures remains unclear—especially for eating-out establishments, as the pandemic-induced shift toward FAH spending could continue. Future research, as more data become available, may be able to examine possible long-lasting behavioral changes in the way people buy food.

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Appendix

Structural Decomposition Analysis (SDA) is a comparative-static technique. SDA is used to decompose the one variable's change into several pre-defined factors, which include a detailed framework of production, as well as final demand by input-output tables and models (Rormose, 2010).

The specific framework for SDAs has evolved in economic literature. Early studies simply performed a first-order Taylor expansion to decompose a specific market change (Saeed, 1976) or were constructed by changing one parameter at a time while holding all remaining parameters constant (Ang et al., 2004). However, these approaches consistently encountered issues caused by an error term unaccounted for (i.e., non-exact results) or arbitrary results (i.e., sensitive to choices for the base year). Betts (1989) introduced a method to overcome these deficiencies by conducting multiple decompositions, and proportionally weighting each, to produce exact and non-arbitrary results. In particular, this method, which was used in this study, decomposes changes into n components without leaving a residual term.

According to Su and Ang (2012), the main criticism of this approach is that analysis can become arduous with too many factors, particularly when using more than 10 factors. However, Li et al. (2019) were able to decompose China's water use into 18 factors using this method. Furthermore, this method was used in Munksgaard et al. (2000) to break down changes in Danish household CO_2 emissions across 10 factors. In addition, Zhang (2009) attributed historical changes in carbon intensity in China to seven specific factors of the economy.

The advantages of this method are threefold. First, the decomposition is exact. Second, the method is not arbitrary in the sense that no choice of the base year is needed. Both of these features can aid in the interpretation of decomposition results. Third, the method is generally applicable for all integers $n \geq 2$.

To understand this method, here is a simple example where $n=2$. Suppose that Y_t is a matrix product of X_t^a and X_t^b.

$$Y = \prod_{i=1}^{n}(X_i) \text{ where } n = 2$$

Then the change in Y between 2 time periods can be decomposed exactly as:

$$\Delta Y = \Delta X^a X_t^b + X_{t-1}^a \Delta X^b \qquad (1)$$

Which could equally well have been written as:

$$\Delta Y = \Delta X^a X_{t-1}^b + X_t^a \Delta X^b \qquad (2)$$

Then, if we take the average of the two equations (1) and (2):

$$\Delta Y = \Delta X^a \left[\frac{X_{t-1}^b + X_t^b}{2}\right] + \left[\frac{X_{t-1}^a + X_t^a}{2}\right] \Delta X^b \qquad (3)$$

The average of these two equations eliminates the need to choose the base year arbitrarily. Betts (1989) generalizes equation (3) to n components. First, consider a difference of two matrix products, each containing n conformable matrices:

$$Y^t - Y^{t-1} = \Delta = \prod_{i=1}^{n} X_t^i - \prod_{i=1}^{n} X_{t\_1}^i \qquad (4)$$

Which can be expressed as:

$$\Delta = \sum_{k=1}^{n} \left\{ \prod_{j<k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \left(X_t^k - X_{t-1}^k \right) \frac{1}{2} \left(\prod_{l>k} X_t^l + \prod_{m>k} X_{t-1}^m \right) \right\} =$$

$$\sum_{k=1}^{n} \left\{ \frac{1}{2} \left(\prod_{l<k} X_t^l + \prod_{m<k} X_{t-1}^m \right) \left(X_t^k - X_{t-1}^k \right) \prod_{j>k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \right\} \qquad (5)$$

Since it is arbitrary which of these two decompositions is used—and since in practice they do not apportion the total change identically among the n factors—Betts (1989) suggests a method which weights the two decompositions, provided by the proposition equally:

$$\Delta = 0.5 \left[\sum_{k=1}^{n} \left\{ \prod_{j<k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \left(X_t^k - X_{t-1}^k \right) \frac{1}{2} \left(\prod_{t>k} X_t^l + \prod_{m>k} X_{t-1}^m \right) \right\} \right] +$$

$$0.5 \left[\sum_{k=1}^{n} \left\{ \frac{1}{2} \left(\prod_{l<k} X_t^l + \prod_{m<k} X_{t-1}^m \right) \left(X_t^k - X_{t-1}^k \right) \prod_{j>k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \right\} \right] \qquad (6)$$

Thus, the change in Y—attributable to the change in matrix k—would be estimated as:

$$\Delta^k = 0.5 \left[\left\{ \prod_{j>k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \left(X_t^k - X_{t-1}^k \right) \frac{1}{2} \left(\prod_{l>k} X_t^l + \prod_{m>k} X_{t-1}^m \right) \right\} \right] + 0.5 \left[\left\{ \frac{1}{2} \left(\prod_{l<k} X_t^l + \right. \right. \right.$$

$$\left. \left. \left. \prod_{m<k} X_{t-1}^m \right) \left(X_t^k - X_{t-1}^k \right) \prod_{j>k} \left(\frac{X_t^j + X_{t-1}^j}{2} \right) \right\} \right] \qquad (7)$$

In this study, Y is the i) food-at-home (FAH) spending and ii) food-away-from-home (FAFH) spending. We attribute food expenditures to four components (i.e., n = 4):

For FAH:

$$FAH_t = \frac{FAH_t}{FAFH_t + FAH_t} * \frac{FAFH_t + FAH_t}{PCE_t} * \frac{PCE_t}{DPI_t} * DPI_t$$

Food at home

= Food at home, as a share of total food spending

* total food spending, as a share of personal consumption expenditure

* personal consumption expenditure, as a share of disposable personal income

* disposable personal income

And similarly, for FAFH:

$$FAFH_t = \frac{FAFH_t}{FAFH_t + FAH_t} * \frac{FAFH_t + FAH_t}{PCE_t} * \frac{PCE_t}{DPI_t} * PDI_t$$