



Economic
Research
Service

Technical
Bulletin
Number 1958

September 2022

Comparing Food Sector Employment Headcount and Sales Data in the National Establishment Time Series Database to Federal Data

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Abstract

This report offers new information about the accuracy of employee headcounts and sales data in the National Establishment Time Series (NETS) Database—which provides time-series data on establishments across all sectors, including grocery stores and food service outlets. NETS is frequently and increasingly being used by researchers to answer questions of policy relevance about the dynamics of the food environment at a more localized level. Therefore, it is important to better understand how NETS food retail and service sectors compare relative to similar Federal datasets. This report compares NETS employment headcount with the County Business Patterns (CBP) at the national and State levels from 1998 to 2016 and compares NETS sales with the Food Expenditure Series (FES) at the national level from 1998 to 2019. Findings show that NETS captures similar employment patterns and trends as the CBP at both the national and State levels for most of the food retail and food service sectors. In addition, this report develops a method and presents newly estimated NETS sales numbers that have similar patterns and trends as the FES, enabling researchers to more accurately study food sales at a more localized level.

Keywords: NETS, National Establishment Time Series Database, FES, Food Expenditure Series, CBP, County Business Patterns, food at home, food away from home, food environment, grocery store, restaurants, supermarket, employee headcount, sales information, U.S. Department of Agriculture, USDA, Economic Research Service, ERS.

Acknowledgments

The authors thank the following individuals for technical peer reviews: Anil Rupasingha, USDA, Economic Research Service (ERS); Joseph Balagtas, Purdue University; Dawn Thilmany, Colorado State University; and Rebecca Nemec, USDA, Office of the Chief Economist. They also thank Lisa Mancino, Debbie Rubas, and Jay Variyam of USDA, ERS for their comments. They also thank Jeff Chaltas and Grant Wall of USDA, ERS for editorial assistance and Adele Wilcoxon, USDA, ERS, for design services. The analysis, findings, and conclusion expressed in the paper should not be attributed to Walls & Associates.

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Contents

Summary	iii
Introduction	1
Data Description	3
National Establishment Time Series (NETS)	3
Imputed County Business Patterns (iCBP)	6
Food Expenditure Series (FES)	6
Economic Census (EC)	7
Data Summary	7
Methodology	8
Comparing Employee Data	8
Changes in NAICS Codes Over Time	8
Comparing and Estimating New Sales Data	9
Results: Data Comparisons	11
Comparing Employee Data	11
State Differences	15
Investigating Differences Across Datasets Based on Firm Employment	19
Results: Sales Estimation	22
Comparing Sales Data	22
Conclusion	29
References	31

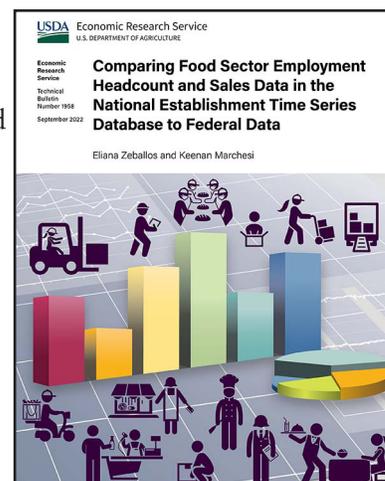
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What Is the Issue

Interest in understanding the dynamics of the food environment is growing, due to the link with overall diet quality and health, an increase in mergers and acquisitions of food establishments, and the importance of employment and sales in the food industry. To facilitate research on these growing areas, USDA, Economic Research Service (ERS) invested in the National Establishment Time Series (NETS) Database, which provides time-series data on establishments across all sectors, including grocery stores and food service outlets. NETS provides annual information such as geographic locations, employment headcount, and total sales for each establishment across the United States.

This study compares NETS employment headcount with the U.S. Census Bureau's County Business Patterns (CBP) at the national and State levels and compares NETS sales with the Food Expenditure Series (FES) at the national level over time. CBP provides information about U.S. business establishments, including the number of establishments, number of employees, and industry type, using the North American Industry Classification System (NAICS), aggregated at the county level every year; however, CBP does not contain sales data. FES provides the most comprehensive measure of the value of food sales in the United States for different types of food retailers every year; however, FES is limited to the national level. By providing both sales and employee information on an annual basis, NETS enables researchers to study the changing food sector and environment in detail and address key research questions for which CBP or FES are not equipped.



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.

What Did the Study Find?

- NETS is comparable with CBP in terms of employment—showing similar trends at the national and State levels for the largest sectors of food-at-home (FAH) and food-away-from-home (FAFH) retailers, such as grocery stores and restaurants.
 - CBP reports higher employment levels for most of the sample period for both FAH and FAFH, with differences never more than 13 percent.
- Results show that NETS is capturing more small establishments (five or fewer employees) than the CBP.
- Findings show that NETS sales trends are lower compared with FES sales trends for the food sector.
 - For FAH, results show that the percent difference between NETS and FES increased over time from less than 10 percent in the early 2000s to almost 30 percent in 2019.
 - For FAFH, results show a similar pattern with the percent difference increasing from less than 10 percent in the early 2000s to almost 50 percent in 2019.
- The report thus calculates new NETS sales information using a sales-per-employee ratio. The resulting estimates follow similar patterns and trends as FES and allows food industry researchers using NETS to better capture the local food environment's dynamics over time.
 - For FAH, the newly estimated NETS sales are higher than FES sales but the difference is never larger than 10 percent, and by 2019 is 3 percent.
 - For FAFH, the newly estimated NETS sales data are about 7 percent below FES in 1997, but the gap narrows to zero in 2012, and by 2019, the newly estimated NETS sales are 8 percent higher than FES.

How Was the Study Conducted?

To obtain a complete picture of the food sector information in NETS, the dataset was compared with CBP for employment at various geographies—State and national—and with FES for sales information at the national level. A sales-per-employee ratio was constructed at the State level using the last five rounds of the Economic Census (EC), which is a complete enumeration of all known employer establishments collected every 5 years, and applied this ratio to NETS using the number of employees to calculate new estimates for sales. By comparing the NETS database to these official datasets whenever available—spatially or temporally—a baseline understanding was created of how NETS estimates compare with Federal estimates for employment and sales.

Comparing Food Sector Employment Headcount and Sales Data in the National Establishment Time Series Database to Federal Data

Introduction

Characterizing and analyzing the localized landscapes of food retailers, such as grocery stores, convenience stores, and restaurants, is increasingly important for policy makers, consumers, producers, and researchers. Therefore, USDA, Economic Research Service (ERS) invested in a time-series database of establishment information across all sectors, including grocery stores and food service outlets—the National Establishment Time Series (NETS) Database—to study the complete food environment and its dynamics. NETS provides annual information such as geographic locations, employment, and total sales for each establishment across the United States.

While NETS provides detailed and granular information of establishments, few studies have examined the coverage and statistical properties of this proprietary dataset, especially for its sales estimates. By acquiring a comprehensive annual database of the food environment, like NETS, researchers are equipped with an initial tool to conduct studies that can address at least four broad interests:

1. the study of potential impacts of the major consolidation and structural changes that the food sector experienced over the last three decades;
2. the estimation of food sales at the State level or even county level to explore a number of important issues related to how consumers respond to changes in the retail food environment at the aggregate level, as well as trends of employment and industry sales at the local level;
3. an understanding of the local food environment as it relates to diet quality and health, especially for low-income U.S. consumers and across the rural-urban divide; and
4. the study of areas with limited food access and the entry/exit of food-at-home (FAH) and food-away-from-home (FAFH) retailers.

This report's goal is to understand the scope of NETS in the food retail sector by comparing two key variables—employment and sales—to Federal data. This study compares NETS employment headcount with the County Business Patterns (CBP) at the national and State level and compares NETS sales with the Food Expenditure Series (FES) at the national level.¹ CBP provides information about U.S. business establishments, including the number of establishments, number of employees, and industry type, using the North American Industry Classification System (NAICS), aggregated at the county level every year. However, CBP does not contain sales data. FES provides annual estimates of food sales at various types of food retailers; however, it is limited to the national level. By providing both sales and employee information annually for

¹ Due to a lack of historical modifications to changes in county Federal Information Processing Series (FIPS) codes and county-level suppression in the CBP, it is increasingly difficult to compare NETS, a dataset that updates its geographic information with the most up-to-date FIPS codes, with the CBP at the county level. Future work could explore methodologies for comparisons across more detailed geography and time.

individual establishments with geographic identifiers, NETS is frequently and increasingly being used by researchers to answer questions about the dynamics of the food environment at a more localized level that are critical for the U.S. Department of Agriculture (USDA) and other key stakeholders. Therefore, it is important to better understand how NETS food retail and service sectors compare to similar Federal datasets.

This report extends the work by Cho et al. (2019), which compared the food industry data of NETS with other proprietary establishment-level databases such as NielsenIQ's TDLinX and The NPD Group's ReCount, which also capture firm-level information for food establishments across the country.² While national and State-level comparisons are uncommon, smaller surveys investigating the validity of NETS at the census tract level were conducted and found general alignment (Rummo et al., 2015; Ma et al., 2013). Neumark et al. (2005) compared employment levels in California reported in NETS with those in the Quarterly Census of Employment and Wages (QCEW), Current Employment Statistics (CES), and the Size of Business data. They found that although NETS is generally reliable, the data are initially imputed for new establishments and considerably rounded for employment estimates, with distributions being typically divisible by 5, 10, or 100, depending on the size of the establishment. Kunkle (2011) compared employment dynamics in NETS with those in unemployment insurance filings (e.g., what underlies the QCEW and CES) and found that during economic expansions and contractions, NETS may better capture employment fluctuations. Barnatchez et al. (2017) conducted a national study comparing NETS data on the number of establishments and employees with data in three Government sources: QCEW, CBP, and Nonemployer Statistics (NES). Their general findings indicate that omitting establishments with 10 or fewer employees from NETS improves the matching between NETS and CBP in about half the sectors studied and suggests this is related to employment imputation values on the part of NETS for small businesses. Relevant to this work, Barnatchez et al. (2017) highlighted that eliminating establishments with 10 or fewer employees from NETS made NETS and CBP employment more comparable for the food retail sector over time but less comparable for food service establishments. These findings provide a framework to explore the food retail sector more closely.

NETS is frequently and increasingly being used to evaluate time-varying changes in establishment growth, performance, and job creation because it provides granular establishment data over a long time period (Artz et al., 2021; Choi et al., 2013; Neumark et al., 2011; Low et al., 2020; Drucker et al., 2019). As NETS tracks numerous characteristics over time, such as sales and the number of employees for individual establishments, it can be used cross-sectionally to explore local business dynamics and neighborhood characteristics (Schuetz et al., 2012). NETS has been used to examine changes in food sales across different food establishment types and geographic locations (Stevens et al., 2021). Further, NETS has been used to explore market concentrations across different geographies (Rossi-Hansberg et al., 2021) and relationships among retail patterns and neighborhood characteristics (Schuetz et al., 2012). In terms of sales data, previous research (Crane and Decker, 2019) raised concerns about the use of NETS sales data, largely driven by the fact that much of the methodology to estimate sales data already in NETS is derived from firm-level employment data, resulting in high levels (between 80 and 95 percent) of imputed data.

² NielsenIQ's TDLinX database is a commercial dataset that focuses on the food-at-home (FAH) industry and provides employment and sales information for FAH retailers such as grocery stores, supermarkets, and convenience stores throughout the United States. The NPD Group's ReCount provides location and business information, such as employment headcounts and service-style categorization, on food away from home establishments throughout the United States (The NPD Group, 2015). For more information, please see Cho et al. (2019).

Data Description

This report discusses four key datasets: NETS, the imputed County Business Patterns (iCBP), FES, and the Economic Census (EC). A summary of these datasets is in table 1, with a more detailed description of each below.

Table 1
Summary of datasets

Dataset	National Establishment Time Series (NETS) database	Imputed County Business Patterns (iCBP)	Food Expenditure Series (FES)	Economic Census (EC)
Years used	Annual, 1998–2019	Annual, 1998–2016	Annual, 1998–2019	Every five years, 1997, 2002, 2007, 2012, 2017
Key variable	Employment, sales	Employment	Sales	Employment, sales
Geography	Establishment level aggregated to State and national geographies	County level aggregated to State and national geographies	National	County, State, and national level
Description	Annual establishment level counts of employment for all sectors of the economy, including food retail	A dataset developed to overcome county-level data suppression in CBP for all economic industries	A comprehensive dataset that measures the U.S. food system, quantifying the value of food acquired in the United States by type of product, outlet, and purchaser	The official measure of businesses and the economy in the United States, it is collected every 5 years and acts as a benchmark for current economic activity such as the Gross Domestic Product and the Producer Price Index
Role in this study	Annual employment estimates are used to provide the foundation for potential expansion of the FES to the State level	Employment headcount is used to compare against NETS annual employment headcount	Total sales are used as a reference to gauge the accuracy of updated sales estimates derived from linking EC, iCBP and NETS	5-year estimates of total sales-to-employment ratios are applied to NETS to update expenditures and generate State-level estimates
Source	Walls & Associates	Eckert et al. (2021), U.S. Department of Commerce, Bureau of the Census	USDA, Economic Research Service	U.S. Department of Commerce, Bureau of the Census

Source: USDA, Economic Research Service.

National Establishment Time Series (NETS)

NETS is a high frequency, longitudinal time-series, proprietary database of establishment information across all economic sectors, including those in the food and agricultural sector, such as grocery stores and food service outlets. Dun & Bradstreet and Walls & Associates created NETS by using Dun & Bradstreet’s archival data from surveys of establishments (Walls & Associates, 2019). Updated each January, NETS provides an annual record with information from 1990 through 2019. NETS contains the geographic coordinates, street address, and county Federal Information Processing Series (FIPS) code for each establishment. Similar geographic information is available for the establishment’s company headquarters along with the total

number of establishments under the same headquarters.³ Each establishment is assigned a unique identification number for both the establishment and its headquarters, allowing users to track establishments under the same parent company. Each establishment typically reports both parent company name (the legally licensed name of a business) and trade name (storefront or banner name).⁴

NETS contains business establishments from a comprehensive list of industries. The database categorizes establishments using Standard Industrial Classification (SIC) numeric codes and provides a crossroad to match to NAICS, allowing users to make standardized industry comparisons with other datasets. NETS annual industry classification codes for each establishment (e.g., SIC19 for 2019) to capture changes in classification over time. Table 1 lists the NAICS codes analyzed in this study for both FAH and FAFH. Given the increasing share of total U.S. food sales at nontraditional FAH retailers such as supercenters and warehouse clubs (USDA, ERS, 2022a and 2022b), categories are included that capture any of the following under FAH establishments: supermarkets, warehouse clubs and supercenters, convenience stores and gas stations with convenience stores, and specialty food stores. Under FAFH establishments, all restaurants (full service and limited service), drinking places, and other miscellaneous FAFH establishments, such as food service contractors and caterers, are included.

Table 2
National Establishment Time Series Database FAH and FAFH store classifications by North American Industry Classification System (NAICS) codes

NAICS code	Group NAICS code	Sector	Description
Food at home (FAH)			
445110	44511	Supermarkets and Other Grocery (except Convenience) Stores	Establishments primarily engaged in retailing a general line of food, such as canned and frozen foods; fresh fruits and vegetables; and fresh and prepared meats, fish, and poultry.
445120	44512	Convenience Stores	Establishments primarily engaged in retailing a limited line of goods that generally includes milk, bread, soda, and snacks.
447110		Gasoline Stations With Convenience Stores	Establishments engaged in retailing automotive fuels in combination with convenience store or foodmart items. These establishments can be in a convenience store (i.e., foodmart) setting or a gasoline station setting.
452311	452311	Warehouse Clubs and Supercenters	Establishments primarily engaged in retailing a general line of groceries, including a significant amount and variety of fresh fruits, vegetables, dairy products, meats, and other perishable groceries, in combination with a general line of new merchandise, such as apparel, furniture, and appliances.
452319	452319	All Other General Merchandise Stores	Establishments primarily engaged in retailing new goods in general merchandise stores (except department stores, warehouse clubs, superstores, and supercenters). These establishments sell a general line of new merchandise, such as apparel, automotive parts, dry goods, hardware, housewares or home furnishings, and other lines in limited amounts, with none of the lines predominating.

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³ This report excludes headquarters from the analysis because most headquarters focus on executing the day-to-day operations of the stores but do not generally participate in the actual sale of foods directly to consumers.

⁴ Every establishment has a company name; however, not all establishments have a trade name.

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445210	4452	Meat Markets	Establishments primarily engaged in retailing fresh, frozen, or cured meats and poultry.
445220		Fish and Seafood Markets	Establishments primarily engaged in retailing fresh, frozen, or cured fish and seafood products.
445230		Fruit and Vegetable Markets	Establishments primarily engaged in retailing fresh fruits and vegetables.
445291		Baked Goods Stores	Establishments primarily engaged in retailing baked goods not for immediate consumption and not made on the premises.
445292		Confectionery and Nut Stores	Establishments primarily engaged in retailing candy and other confections, nuts, and popcorn not for immediate consumption and not made on the premises.
445299		All Other Specialty Food Stores	Establishments primarily engaged in retailing miscellaneous specialty foods (except meat, fish, seafood, fruits and vegetables, confections, nuts, popcorn, and baked goods) not for immediate consumption and not made on the premises.
Food away from home (FAFH)			
722511	7225	Full-Service Restaurants	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.
722513	7225(9)	Limited-Service Restaurants	Establishments primarily engaged in providing food services (except snack and nonalcoholic beverage bars) where patrons generally order or select items and pay before eating.
722514		Cafeterias, Grill Buffets, and Buffets	Establishments known as cafeterias, grill buffets, or buffets, primarily engaged in preparing and serving meals for immediate consumption using cafeteria-style or buffet serving equipment, such as steam tables, refrigerated areas, display grills, and self-service nonalcoholic beverage dispensing equipment. Patrons select food and drink items on display in a continuous cafeteria line or from buffet stations.
722515		Snack and Nonalcoholic Beverage Bars	Establishments primarily engaged in preparing and/or serving a specialty snack, such as ice cream, frozen yogurt, cookies, or popcorn; or serving nonalcoholic beverages, such as coffee, juices, or sodas for consumption on or near the premises.
722410	7224	Drinking Places (Alcoholic Beverages)	Establishments known as bars, taverns, nightclubs, or drinking places primarily engaged in preparing and serving alcoholic beverages for immediate consumption; may also provide limited food services.
722310	7223	Food Service Contractors	Establishments primarily engaged in providing food services at institutional, governmental, commercial, or industrial locations based on contractual arrangements for a specified period of time.
722320	7223(9)	Caterers	Establishments primarily engaged in providing single event-based food services.
722330		Mobile Food Services	Establishments primarily engaged in preparing and serving meals and snacks for immediate consumption from motorized vehicles or nonmotorized carts.

Note: Group North American Industry Classification System (NAICS) codes are the combined NAICS codes used throughout the report and on all figures.

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

In addition, NETS provides the annual sales and number of employees for each establishment. Sales are reported as gross annual sales in nominal dollars while employee headcount totals are listed for each year an establishment is open. An associated annual code indicates the level of reporting accuracy.⁵ These estimates are often imputed annually at the establishment level and constructed to be used in time trend analyses, the main advantage of using this dataset.

Imputed County Business Patterns (iCBP)

CBP is an annual data series that provides the most comprehensive coverage of establishment and employment headcounts by NAICS industry codes at the national, State, and county levels. The original CBP data is a combination of multiple datasets maintained by the U.S. Department of Commerce, Bureau of the Census' Business Register;⁶ EC; Annual Survey of Manufactures; and Current Business surveys from the U.S. Bureau of Economic Analysis, among other administrative records.

CBP employs noise infusion and suppresses employment headcounts to protect individual business information from public disclosure.⁷ This methodology means that full information is not readily available for all industries. To circumvent these issues, Eckert et al. (2021) developed a methodology for estimating suppressed cells at the county level and provided the imputed employment headcounts on their website for public use.⁸ This imputed version of the CBP (iCBP) was used from 1998 through 2016 for comparisons with NETS.⁹ Although Eckert et al. (2021) point out that the values are internally consistent, these authors cannot guarantee the values represent the true data originally obscured in the CBP. This is important to note because the aim of this report is to provide as clear a comparison as possible while knowing all data have limitations, and this fact could contribute to differences between the datasets.

Food Expenditure Series (FES)

FES is a comprehensive dataset that measures the U.S. food system, quantifying the value of food acquired in the United States by type of product, outlet, and purchaser. FES is used to track developments in consumer food acquisitions and the food supply, and to evaluate changes in food spending and the composition of the food marketing system over time. FES uses data from the EC, Census Bureau monthly and annual surveys, other U.S. statistical agencies, and data from trade associations to produce monthly and annual outputs describing the U.S. food system over time.

FES presents the total value of food and beverage acquisitions in several ways to permit analysis of expenditures. These include type of product (food and alcohol for off- and on-premises consumption); outlet type (e.g., grocery stores, full-service restaurants, hotels, and motels); final purchasers (e.g., individuals/households,

⁵ In 2019, for nonheadquarter establishments, NETS estimates about 56 percent of employment data and about 97 percent of sales data.

⁶ The Business Register is a database of all known single- and multi-establishment employer companies maintained and updated by the Census Bureau.

⁷ Noise infusion as defined by the Census Bureau "is the method of disclosure avoidance in which data values for a given establishment are perturbed prior to table creation by applying a random noise multiplier to" the data value in question (such as employment) for each establishment. For a more detailed understanding of noise infusion, please see Evans et al. (1998).

⁸ For a more detailed description of the methodology used for these calculations, see Eckert et al. (2021).

⁹ Data from 1998 to 2016 are utilized for two reasons. First, the CBP altered its reporting of information for suppressed cells in 2017. Prior to this, CBP would report establishments and leave employment suppressed. However, in 2017 CBP began suppressing not only employment but also counties and industries that had three or fewer establishments from the data. Second, the imputed data at the time of this report was only available through 2016.

government, businesses, and nonprofit organizations); and individual/household final users on a per household basis and as a share of disposable personal income. Moreover, FES captures food purchases and food acquisitions, such as food produced at home, food furnished at 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 expenditure on food that consumers bring home to prepare and consume. FAFH is spending on meals prepared or consumed outside of the home, such as in restaurants and cafeterias. Most FAH expenditures occur at grocery stores, but the sector can also include supercenters, convenience stores, and other retailers. The majority of FAFH spending is at full-service restaurants (FSRs) or limited-service restaurants (LSRs), but the category also includes cafeterias, sports venues, or other eating places.

Economic Census (EC)

The Census Bureau conducts the EC, which serves as the official measure of businesses in the economy. Collected every 5 years, the EC acts as the benchmark for important economic and business indicators, such as the Gross Domestic Product and the Producer Price Index (Census Bureau, 2019). The EC is a complete enumeration of all known employer establishments. Nearly 4 million businesses—large, medium, and small—covering most industries and all geographic areas of the United States are surveyed with questions tailored to their primary business activity. For most sectors in the EC, only large, medium, and multi-establishment firms are part of the main survey. To capture small business statistics, the EC uses a sample of small employers with paid employees. This sample consists of single-establishment firms with payroll below a specified cutoff. However, for very small firms, including nonemployer establishments, the Census Bureau uses data from existing administrative records of other Federal agencies, such as the Internal Revenue Service. These records provide basic information for the business, including sales, payroll, number of employees, legal form of organization, and other statistics across all industries. Despite this complete coverage, the EC is only taken every 5 years, so researchers seeking more frequent information must interpolate the off years or turn to other sources.

Data Summary

These datasets provide a variety of opportunities to understand the food environment when looked at together. The iCBP provides annual estimates of employment and establishments but lacks sales information. While aiming to overcome data suppression in original data, it still has the potential to not represent original data. The EC provides these estimates, as well as sales information, but data are only collected every 5 years, missing key dynamics and potentially nonemployers or small establishments. The FES provides a comprehensive assessment of all sales in the United States but cannot provide more granular estimates. NETS provides all three statistics—employment, establishment counts, and sales—but at various levels of imputation and accuracy, as reported in the data itself. However, by attempting to synthesize these data products together, the authors aim to provide a framework for research to understand key metrics in the food environment.

Methodology

Comparing Employee Data

To compare the employee information provided by NETS to the iCBP, the aggregated values were compared from NETS at the State- and national-level for all NAICS codes in table 2 from 1998 to 2016. Similarly, since Eckert et al. (2021) provided imputed employment headcount estimates at the county-level, values were also aggregated from iCBP to the State and national level.¹⁰ These merged datasets were then compared with each other, similar to research conducted by Barnatchez et al. (2017).

Changes in NAICS Codes Over Time

Every 5 years, the Census Bureau Economic Classification Policy Committee—as mandated by the Office of Management and Budget—is asked to review and determine the current NAICS classification systems (Census Bureau, 2021). While most industries in this study were not reclassified to a new NAICS code with each EC, some were split and separated to multiple NAICS codes. To account for this in the iCBP and EC, we used the EC and the Annual Retail Trade Survey (ARTS) to estimate the share of businesses that were reclassified to each new NAICS code with each EC. The EC uses the NAICS classification that is valid that year, whereas the ARTS always uses the 2012 NAICS classification. Note that ARTS is benchmarked to the EC, so therefore the sales information provided in ARTS is comparable with the EC.

The first instance for the reclassification of NAICS codes was for Department Stores (NAICS code 452110) in 1997 to Department Stores Excluding Discount Department Stores (NAICS code 452111) and Discount Department Stores (NAICS code 452112) in 2002. Using the EC and ARTS in 1997, a percent of businesses allocated from 452110 to both 452111 (43 percent) and 452112 (57 percent) in 1997 was estimated. This percent was applied in all of the years where 452110 appeared in the data.

The second occurrence was the reclassification of a portion of Discount Department Stores in 2017—from 452112 (Discount Department Stores) in 2012 to join with Warehouse Clubs and Supercenters (NAICS code 452311) in 2017.¹¹ A similar methodology was applied using the EC and ARTS for 2017 and calculating the percent of businesses allocated from 452112 to both 452311 (Warehouse Clubs and Supercenters, 81 percent) and 452210 (Department Stores, 19 percent) for the EC and iCBP. For NETS, we explored micro-level business information for NAICS codes classified as Warehouse Clubs and Supercenters, Grocery Stores, and Department Stores, in order to more accurately reclassify stores due to the previously mentioned changes. We searched major retailers based on the unique headquarters or parent company code (HQDuns) across these sectors to reclassify establishments in NETS that may have been classified as another type of establishment due to changing NAICS codes over the years (mostly misclassified Discounted Department Stores). We also expanded the search of Mass Merchandisers, as some discount retailers which typically would be considered a mass merchandiser were in the Discount Department Store category.

¹⁰ State-level information sometimes remained suppressed due to disclosure risks in the CBP, and thus the imputed CBP (iCBP) estimates provide more guidance. At the national level, there is a noticeable decrease across total employment in some industries of the food sector from 2007 through 2012 for the official CBP, and this decrease is not found in the aggregate iCBP. Therefore, the iCBP is used for national estimates. In the case of Washington, DC, no information was available for several NAICS classifications prior to 2004, and in these instances, data from the CBP was used to supplement the iCBP.

¹¹ Supercenters are categorized under the general NAICS code for General Merchandise Stores and Warehouse Clubs and Supercenters because of the wide variety of products offered by these establishments (Census Bureau, 2012). In NETS, as well as in the Economic Census until 2017, supercenters were found in both the Warehouse Club stores and Discount Department Stores categories. In 2017, the EC reclassified discounted department stores into two categories: (1) stores that sell a wide variety of general merchandise in department stores with separate cash registers and sales associates for each department are classified as Department Stores (except Discount Department Stores), and (2) stores that sell a wide variety of general merchandise in combination with a general line of perishable groceries—such as fresh meat, vegetables, and dairy products—are classified as Warehouse Clubs and Supercenters.

Having accounted for changes in NAICS codes over time, like industries were grouped following the methodology that FES uses—for example, grouping Meat Markets, Fish and Seafood Markets, Fruit and Vegetable Markets, Baked Goods Stores, and Confectionery and Nut Stores into one category called Specialty Food Stores (table 2).

To examine the comparability of the two datasets, the average percent difference between the employment values from NETS and iCBP by State and year for each NAICS code was calculated, as seen in equation (1):

$$\frac{NETS-iCBP}{\left(\frac{NETS+iCBP}{2}\right)} \times 100$$

A larger positive value indicates a higher employment headcount in NETS, while a larger negative value indicates a higher employment headcount in iCBP.

Comparing and Estimating New Sales Data

The approach for comparing sales data is similar to how employment statistics were compared. To compare the sales information provided by NETS with FES, the aggregated values from NETS at the national level for all recorded FAH and FAFH establishments operating in the U.S. from 1997 to 2019 were compared to the corresponding records in FES. To accurately compare NETS sales with FES—since FES captures only the value of food acquired in the United States—the portion of sales in NETS for food and nonalcoholic beverages meant for both at-home and away-from-home consumption was calculated. In a similar procedure as FES, this report used the Product and Service Codes (PSCs) to capture the percentage of food specific sales for the selected industries to better measure food sales. Following FES’ methodology, all PSCs related to food and nonalcoholic beverages were classified as FAH if they were sold for off-premises consumption or as FAFH if they were sold for on-premises consumption. Using these percentages, the portion of FAH and FAFH sales were calculated for each establishment in NETS for each NAICS code.¹²

To examine the comparability of the two datasets, the average percent difference between the sale values from NETS and FES by year was calculated for each NAICS code:

$$\frac{NETS-FES}{\left(\frac{NETS+FES}{2}\right)} \times 100$$

Again, a larger positive value indicates higher sales value in NETS, while a larger negative value indicates a higher sales value in FES.

¹² For more information, see appendix tables A1a-A1d of Okrent et al. (2018).

After comparing NETS sales data to FES, a two-step process was developed to minimize differences between NETS and FES sales information. First, a ratio of total sales to number of employees was calculated by using the last five rounds of EC for each NAICS code in the study by State:¹³

$$\text{Ratio}(i) = \frac{\text{Total Sales}(i)_{EC}}{\text{Number of Employees}(i)_{EC}}$$

Since the EC is completed every 5 years, a linear interpolation of the ratio between the ECs was performed with the aid of the consumer price index for food to calculate the ratio from 1990 to 1997 and from 2017 to 2019. Once this ratio was determined for each State, year, and NAICS code, estimated total sales were adjusted at each establishment in NETS by multiplying this ratio by the number of employees.

$$\text{Adjusted sales}(i)_{NETS} = \text{Ratio}(i) * \text{employees}(i)_{NETS}$$

¹³ For certain years and NAICS codes at the State level, the EC suppresses information for sales and number of employees but presents the number of establishments. In these instances, the authors first tried to impute this missing information for sales and number of employees by calculating two ratios at the State level for each NAICS code: (1) the number of employees to number of establishments and (2) total sales to number of establishments. Then, the authors performed a linear interpolation of these ratios for missing years. When this was not possible, the authors used the ratio at the national level for each NAICS code. These imputed ratios were then used to estimate the number of employees and sales when information was suppressed by multiplying these ratios by the number of establishments.

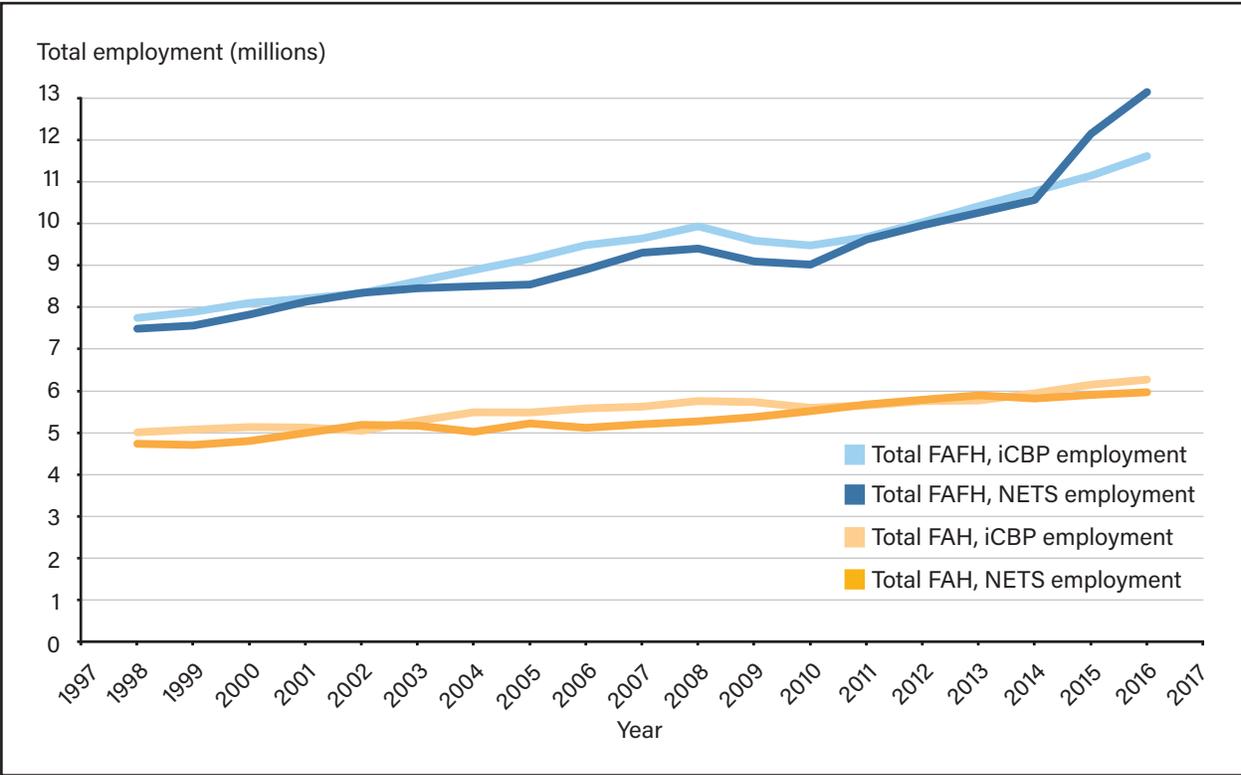
Results: Data Comparisons

Comparing Employee Data

Total number of FAH and FAFH establishments was assembled within both the iCBP and NETS by county and NAICS code to compare the two datasets.

Initially, the results compare the overall total employment for both FAH and FAFH in NETS and iCBP for each year in the sample, across the United States (figure 1), as well as compare the percent difference between the two datasets for both FAH and FAFH (figure 2). Generally, the iCBP reported higher employment levels than NETS for most of the sample period for both FAH and FAFH but usually never more than a 13-percent difference.

Figure 1
Annual total employment in the United States in iCBP and NETS, for FAH and FAFH



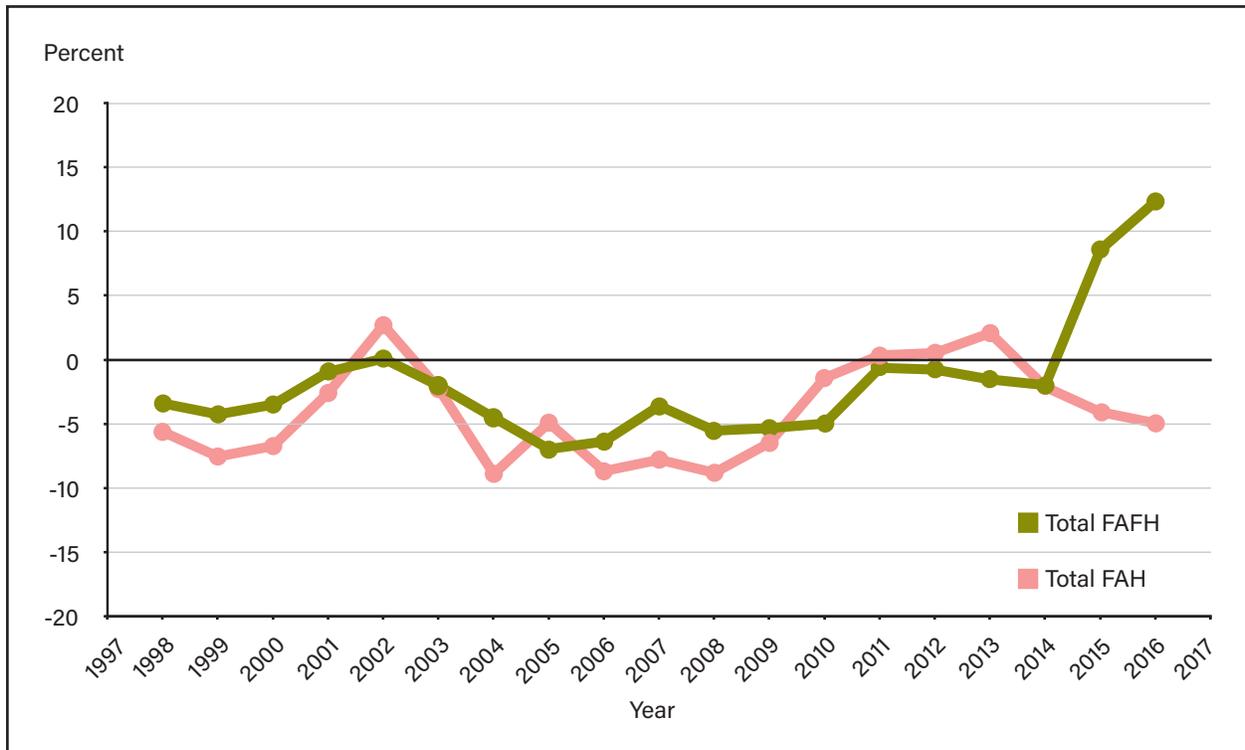
Note: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

NETS generally estimated lower employment in both industries—relative to iCBP for most of the sample period—until 2015 and 2016. Prior to 2015, the percent difference between NETS and iCBP remained between -7 and 0 percent for the FAFH industry, but in 2016, the difference in employment hit a new high of 12.4 percent between the two datasets. For the FAH industry, the percent difference between the two datasets was between -10 and 3 percent over the sample period.

Figure 2

Annual percent difference in total U.S. employment between iCBP and NETS, for FAH and FAFH



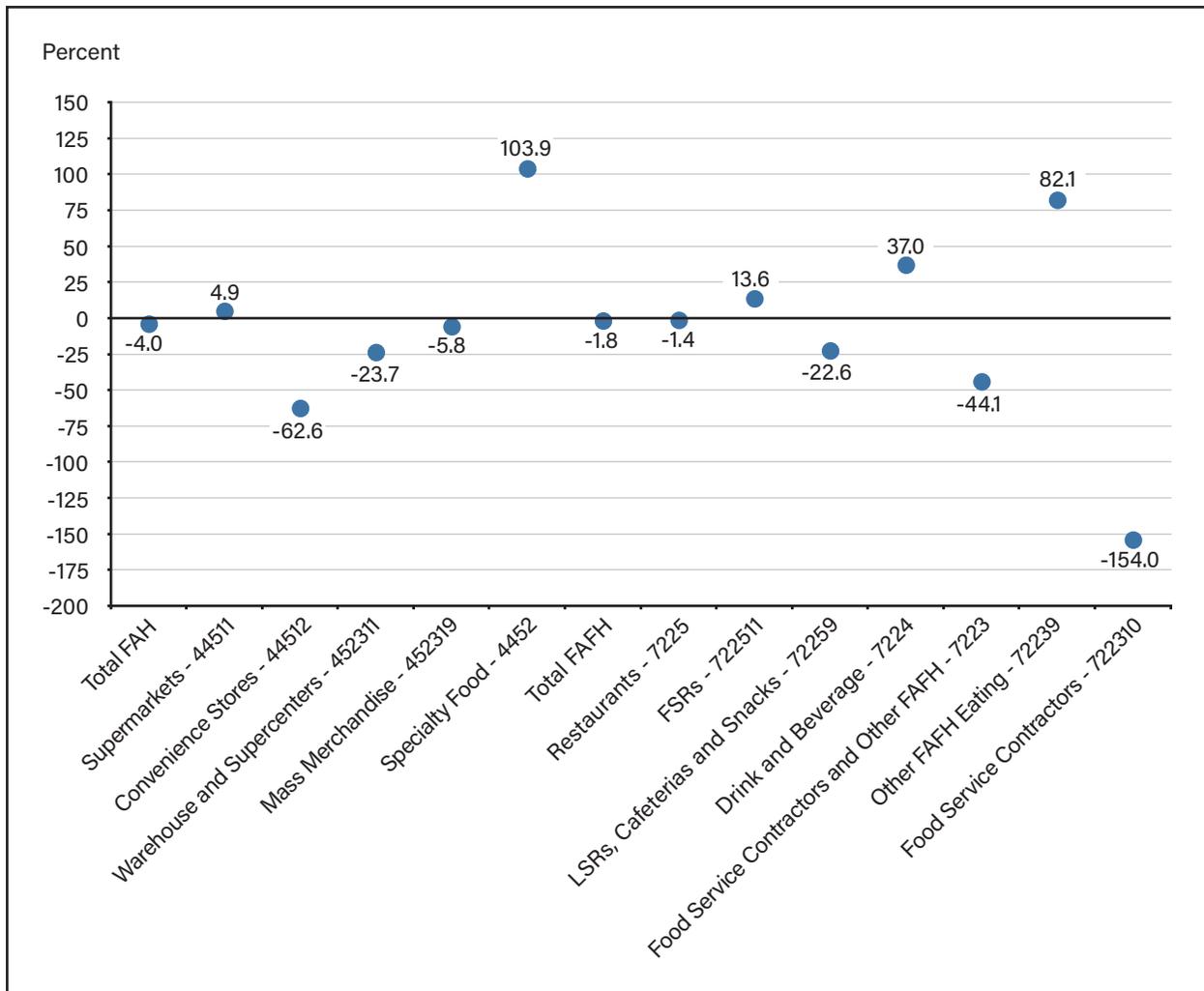
Note: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

Figure 3 displays the average national percent difference by year for each NAICS code, with the corresponding circles displaying the average percent difference across all years for each NAICS code. This gives a snapshot of overall performance by providing not only the average percent difference across all years for each NAICS code but allowing a comparison of the annual differences across industries. The average percent difference for FAH employment was relatively lower in NETS compared with iCBP (-4.0 percent) over the sample period. NETS tends to capture higher employment at specialty food stores (103.9 percent), while capturing relatively fewer employees for convenience stores (-62.6) and warehouses and supercenters (-23.7 percent). For the remaining FAH, NETS was fairly consistent relative to iCBP for capturing supermarket employment (4.9 percent), as well as mass merchandise employment (-5.8 percent).

Figure 3

Average percent difference in total U.S. employment between iCBP and NETS, by NAICS, for FAH and FAFH industries



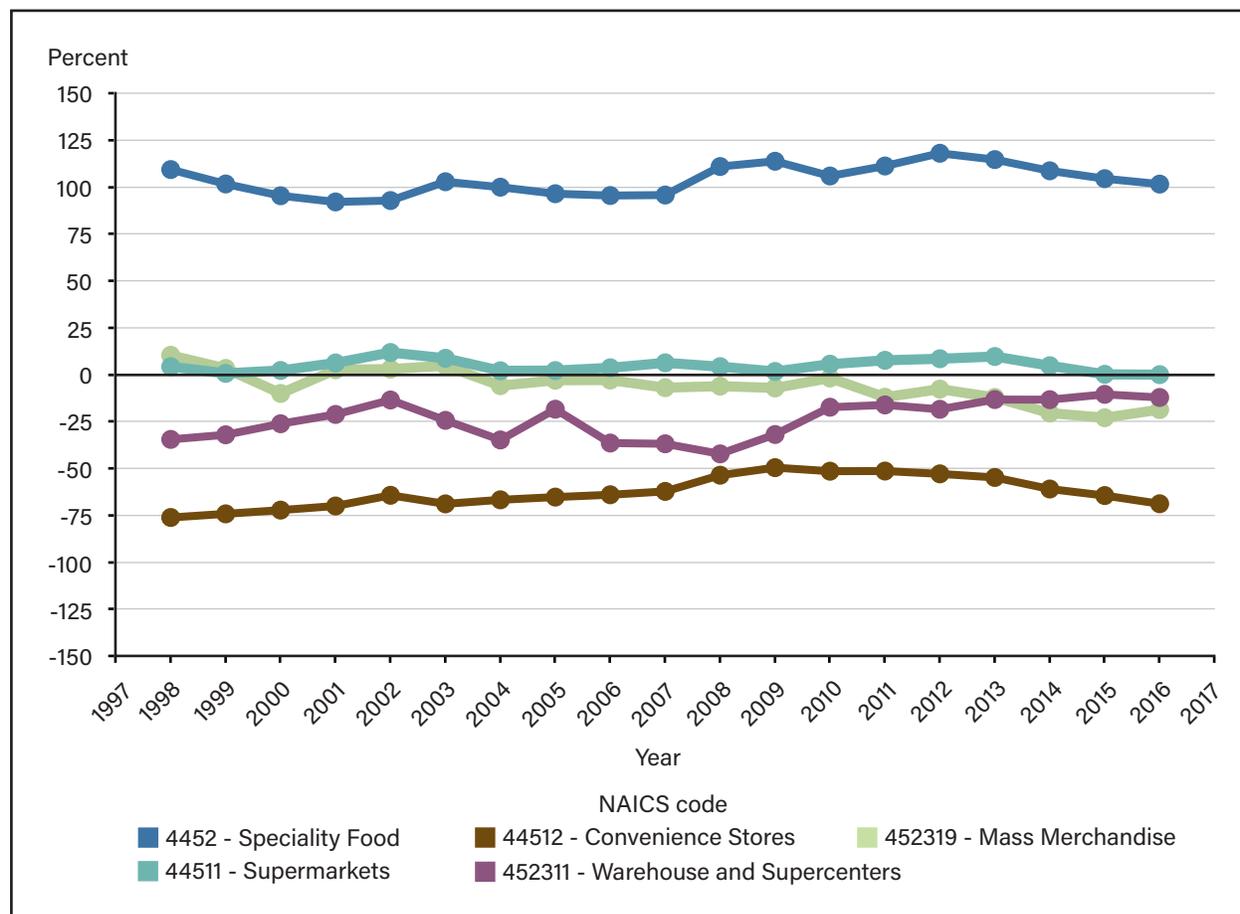
Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home; FSRs = Full-Service Restaurants; LSRs = Limited-Service Restaurants. Each circle represents the average percent difference for all years by North American Industry Classification System (NAICS) code.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

For the general FAFH environment, NETS was fairly similar in terms of employment relative to iCBP (-1.8 percent), and this similarity was also observed for restaurant employment (full- and limited-service restaurants), with only a -1.4 percent difference from official records. When examining the differences in employment between full-service restaurants (FSRs) and limited-service restaurants (LSRs), NETS reported slightly higher employment, on average, in FSRs (13.6 percent) and relatively lower employment for LSRs (-22.6 percent). This is most likely due to classification differences among restaurants between the two datasets. NETS, on average, reported relatively higher employment at drink and beverage establishments (37.0 percent). In examining the differences in employment for food service contractors and other FAFH eating establishments as one, iCBP reported relatively higher counts of employment—an average of 44.1 percent. When looking at these two industries independently, other FAFH eating establishments were generally higher (82.1 percent), whereas employment for food service contractors was notably lower (-154 percent) in NETS than what was found in iCBP.

These trend lines over time helps better understand FAH (figure 4) and FAFH (figure 5) employment differences across sectors. Employment headcounts between NETS and iCBP for supermarkets were relatively similar across the two datasets, ranging between 0 and 12 percent for most of the sample period. The difference in employment captured at mass merchandisers across the two datasets increased (in absolute terms) from 11 percent in 1998 to -18.5 percent in 2016. Notably, the relative difference between warehouse and supercenter employment in NETS and iCBP shrank—in absolute value—since 2010, seeing only a -17.2-percent difference across the two datasets that year, slightly less than half of the percent difference in 2008, and the percent difference shrank throughout the remainder of the sample period—about 12 percent as of 2016. NETS generally reported higher employment for specialty food stores (generally above 90 percent) when compared with iCBP but lower employment for convenience stores (generally 50 percent fewer).

Figure 4
Annual percent difference in total U.S. employment between iCBP and NETS, for FAH industries



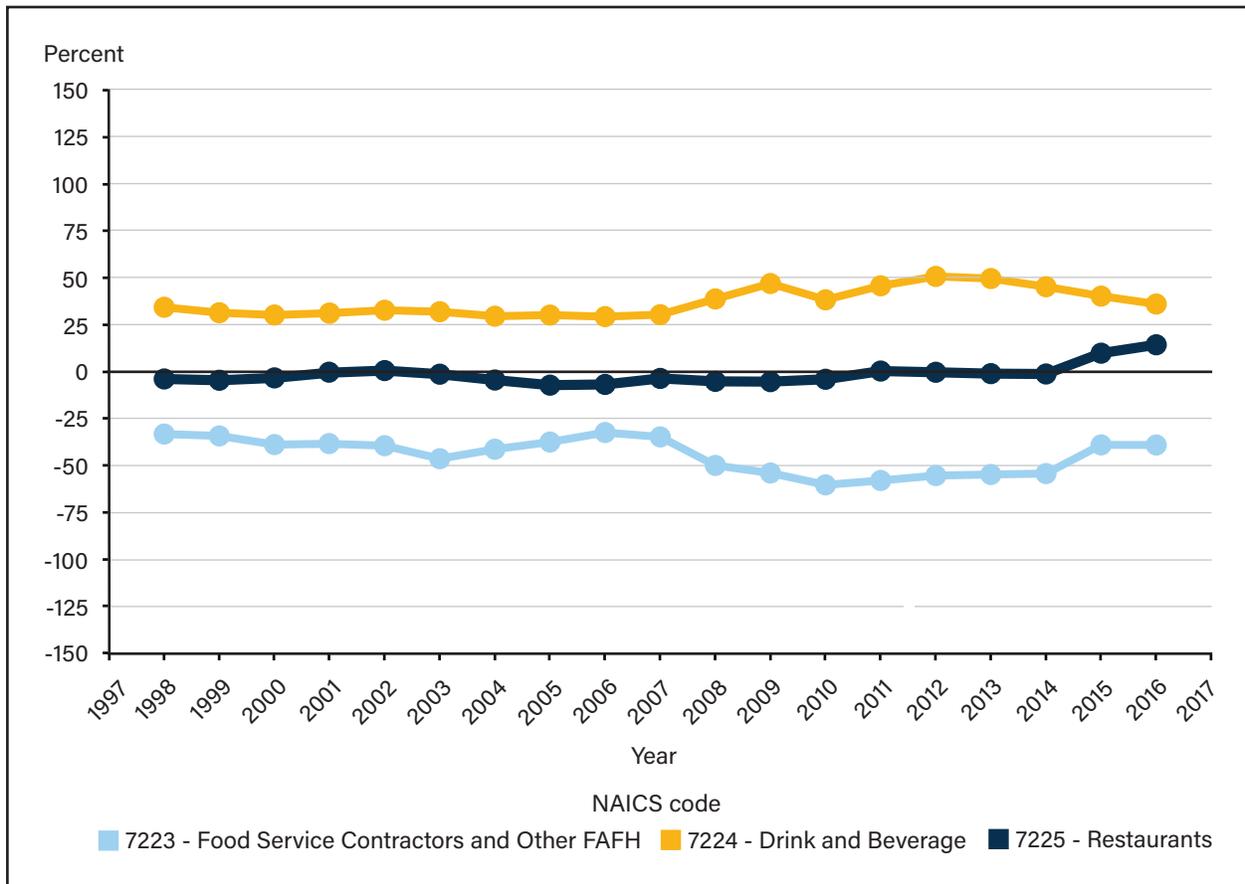
Note: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; NAICS = North American Industry Classification System.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

The broader categories for FAFH are as follows: restaurants (combination of LSRs and FSRs), drink and beverage stores, and other FAFH stores (figure 5). When comparing the total employment for these sectors across the two datasets, little variation is found across NETS and iCBP, where the average of the percent difference is -1.8 percent (figure 3). The restaurant industry saw the smallest amount of variation in employment between the two datasets (ranging between -7.1 and 1 percent for most of the sample). In general, NETS was relatively similar to iCBP in terms of restaurant employment, reporting relatively lower employment in food service contractors and other FAFH establishments and showing relatively higher employment in drink and beverage establishments.

Figure 5

Annual percent difference in total U.S. employment between iCBP and NETS, for FAFH industries



Note: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAFH = food away from home; NAICS = North American Industry Classification System.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

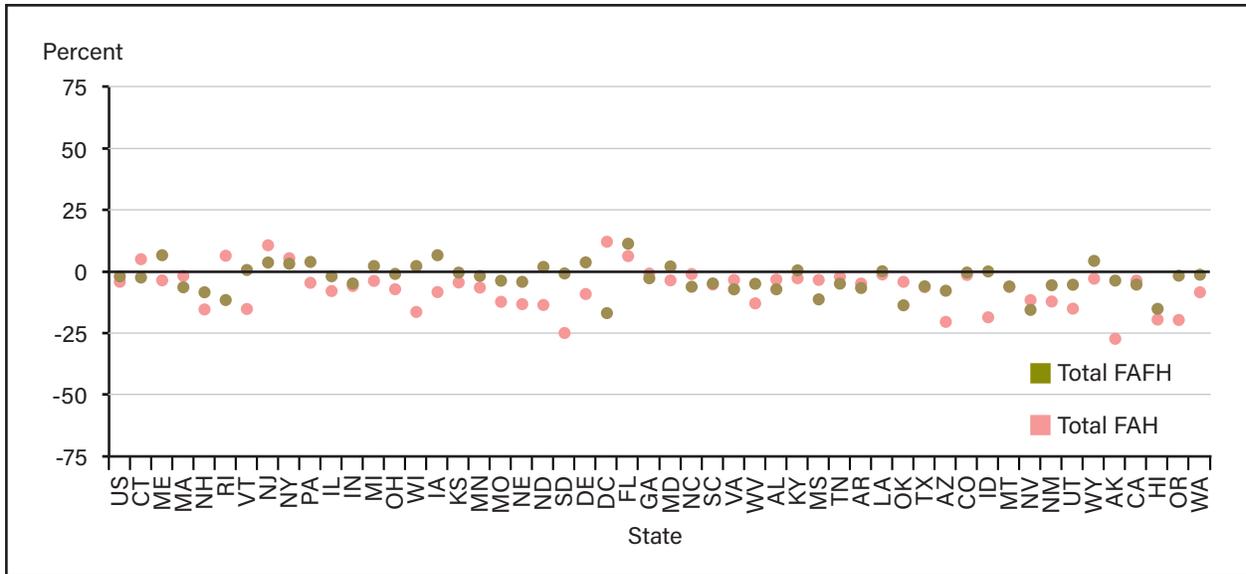
State Differences

This report explores variation across States over time by looking at average percent differences in employment across all years for the aggregate FAH and FAFH industries by State and Washington, DC (figure 6), and the averages across all years for individual FAH and FAFH industries at the State level (figure 7).¹⁴ On average, iCBP showed slightly higher employment for FAFH in most States over the sample period—35 States have a percent difference below 0. The iCBP reported higher employment for FAH industries for all but 6 States, and the average percent difference among those other 45 States was about -8.7 percent. Across several States, NETS reported relatively higher employment for specialty food stores compared with iCBP. Overall, convenience stores were one of two sectors in the FAH industry where NETS reported relatively lower employment headcounts. This was one of the few sectors with relatively low employment relative to iCBP—lowest for more than 10 States. Food service contractors and other FAFH establishments were the other most common industry with relatively lower employment in NETS relative to iCBP. Employment headcounts across the two datasets seem most similar for restaurants and supermarkets, the two largest contributors to employment for the food retail landscape.

¹⁴ States are organized alphabetically by census division and region. The average percent difference for each State for a single year was also presented for 2011 (figure 8) to understand the consistency of this variation. The year 2011 was the last year before significant changes in NAICS classification occurred and provided similar estimates to other years pre- and post-NAICS code changes.

Figure 6

Average percent difference in total State employment across all years between iCBP and NETS, by State, by FAH, and FAFH industries

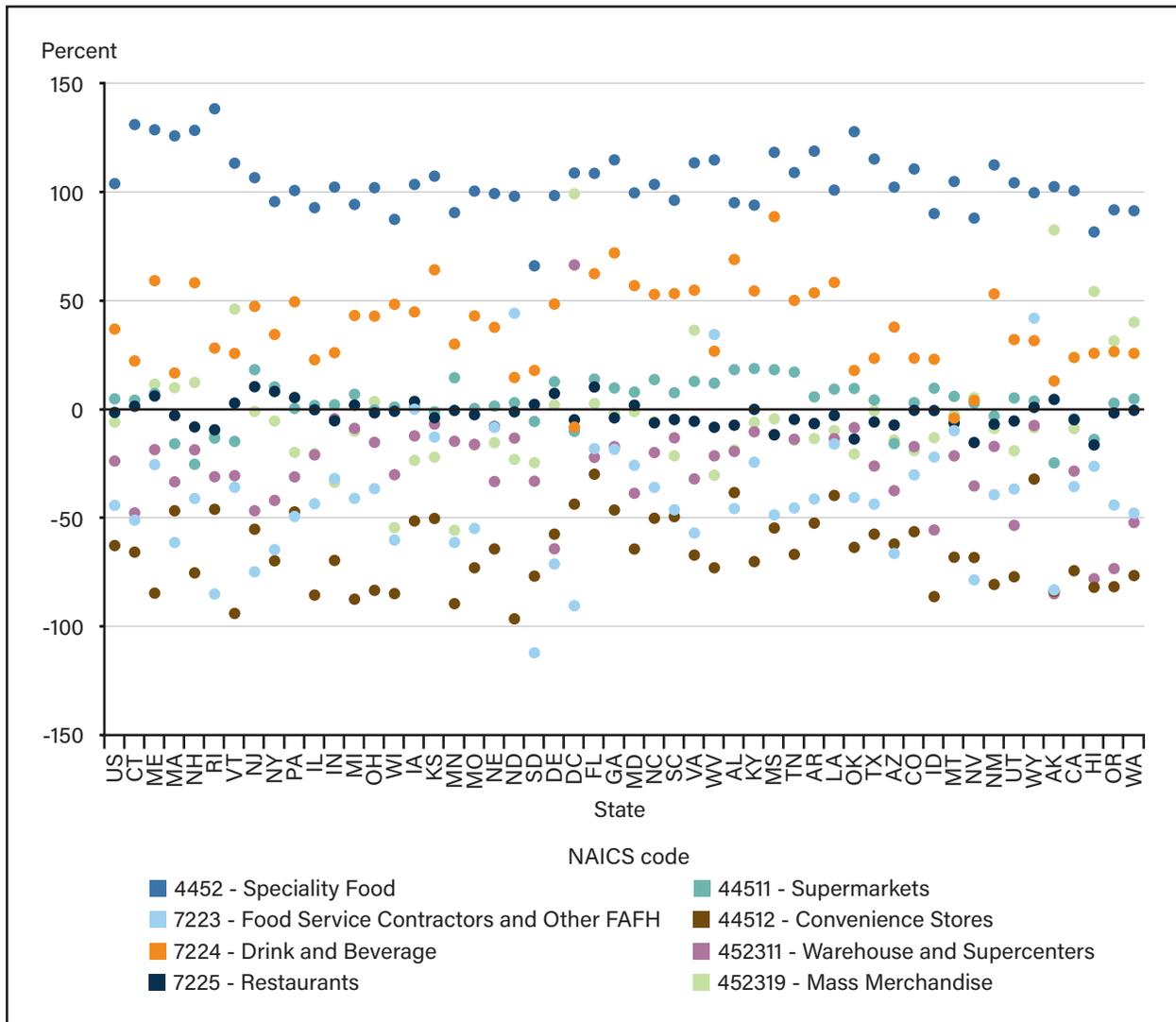


Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home. States are identified by United States Postal Service abbreviations.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

Figure 7

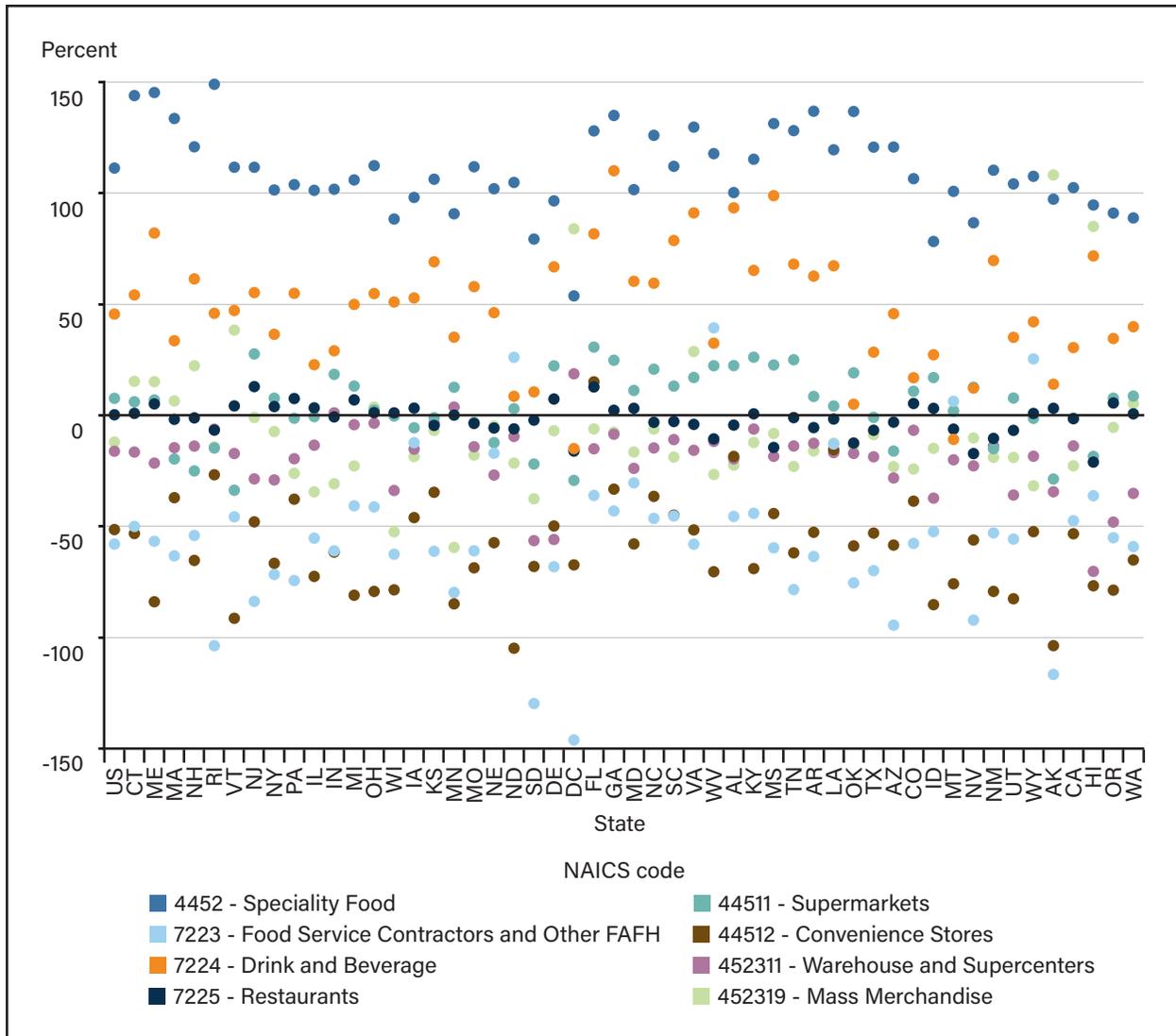
Average percent difference in total State employment across all years between iCBP and NETS, by State, by FAH and FAFH industries



Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home; NAICS = North American Industry Classification System. States are identified by United States Postal Service abbreviations.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

Figure 8
Percent difference in total State employment in 2011 between iCBP and NETS, by State, by FAH and FAFH industries



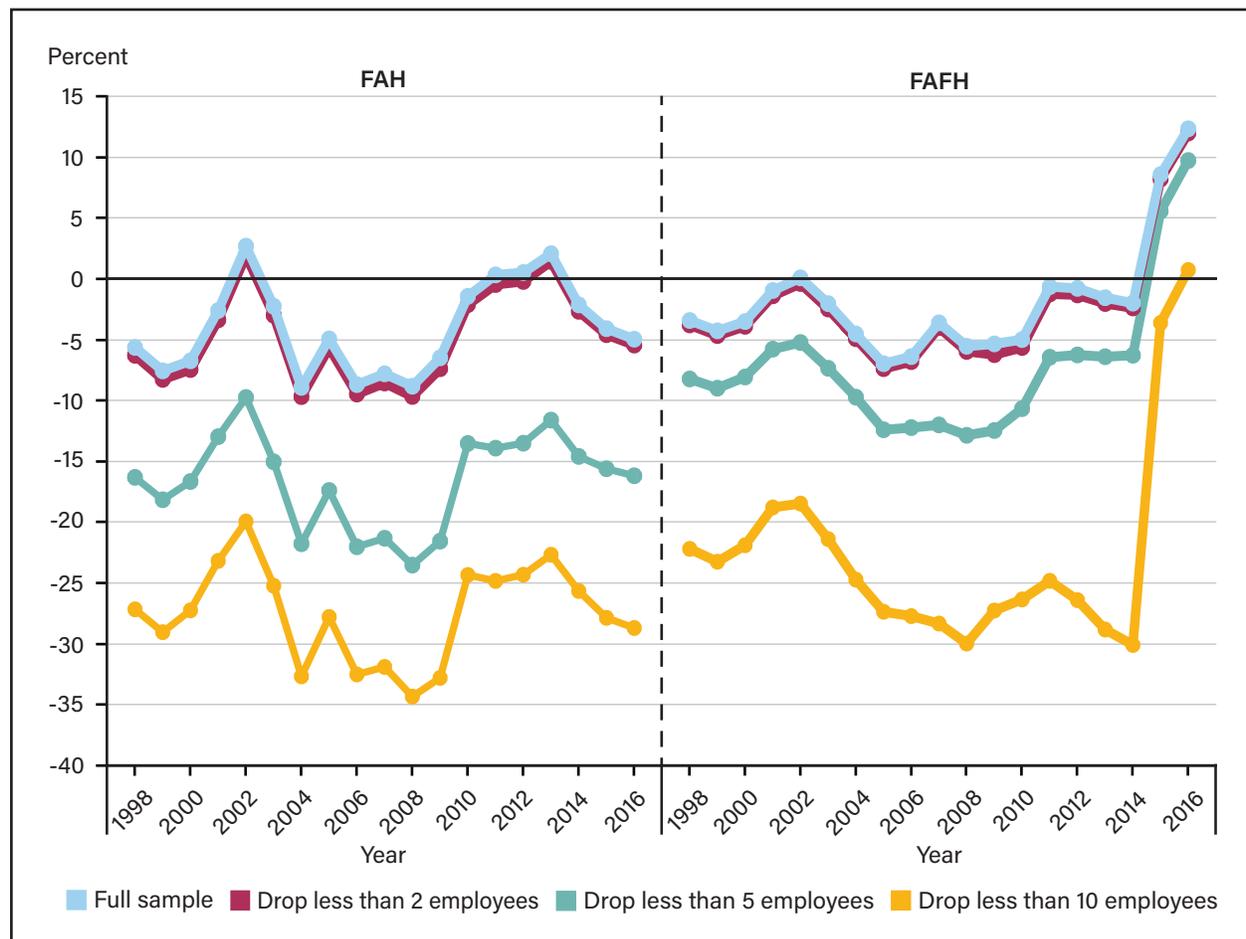
Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home; NAICS = North American Industry Classification System. States are identified by United States Postal Service abbreviations.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

Investigating Differences Across Datasets Based on Firm Employment

Like Rossi-Hansberg et al. (2021), the authors of this report investigate whether the differences across the datasets are reduced by removing nonemployer establishments that are frequently accounted for in NETS but not accounted for in iCBP. For the overall FAH and FAFH sectors, enterprises with only 1 employee, fewer than 5 employees, and fewer than 10 employees are removed and the percent differences relative to iCBP are calculated (figure 9).

Figure 9
Annual percent difference in total U.S. employment between iCBP and NETS, for FAH and FAFH industries, dropping those establishments with less than 2, 5, and 10 employees



Note: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home; FAFH = food away from home.

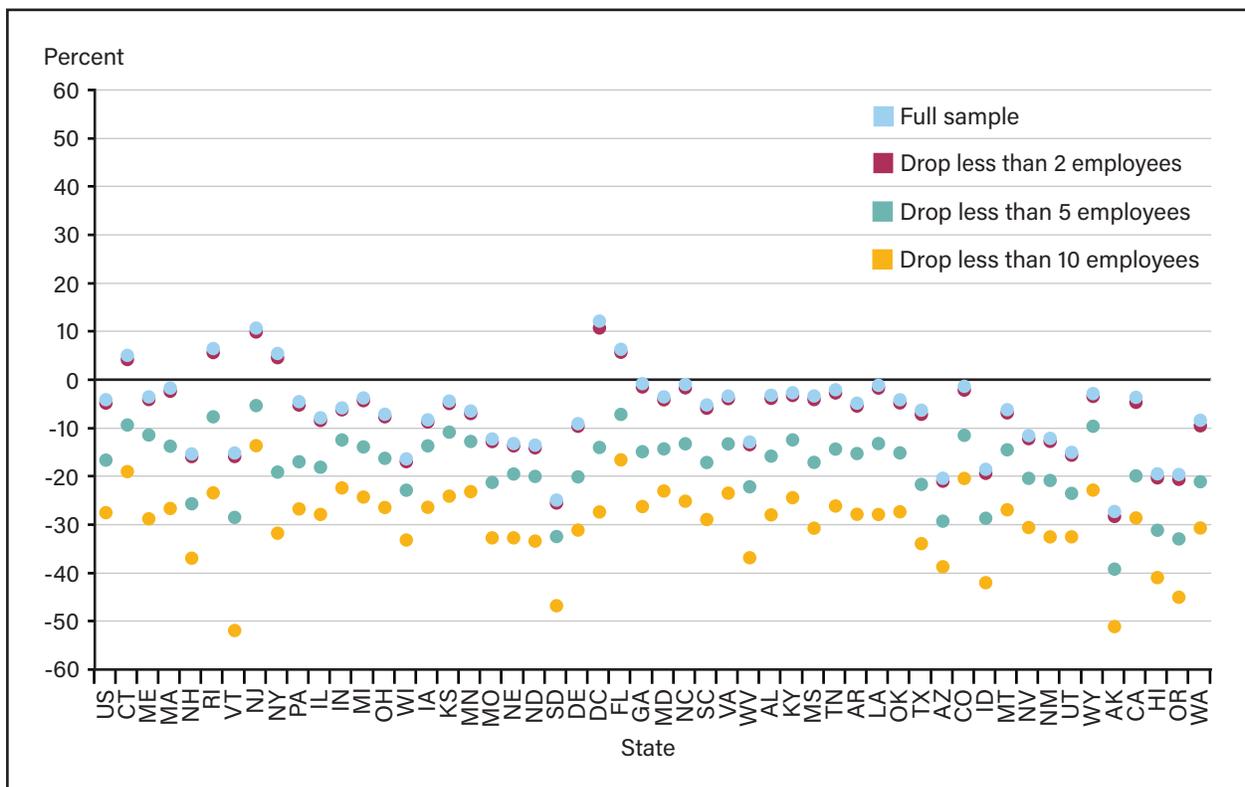
Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021).

As seen in comparing the annual percent differences for employment for FAH and FAFH in figure 9, nonemployer enterprises may be captured more frequently for FAH than for FAFH in the full NETS database, depending on the level of employment removed (i.e., removing establishments with only 1 employee, fewer than 5, and fewer than 10). The difference in employment across the two datasets when removing establishments based on employee counts is largely just shifting parallel trends (i.e., overall trends remain unchanged while counts are lower).

Removing establishments with only one employee from NETS resulted in no large change in the percent difference between NETS and iCBP for FAH when compared to percent differences between the full sample of NET relative to iCBP—the percent difference between the two datasets remained mostly between -10 and 5 percent for most years. For FAFH trends, not much difference existed between NETS and official records when removing establishments of varying employment headcounts. The average percent difference between employment estimates across the two datasets is presented for both FAH (figure 10) and FAFH (figure 11), providing a visualization of the average percent difference when eliminating nonemployers (firms with 1 employee), establishments with fewer than 5 employees, and establishments with fewer than 10 employees at the State level.

In general, the national-level patterns hold across most States, suggesting there is little variation that is likely attributed to nonemployer establishments in the FAFH sector between NETS and iCBP. The shifting trends observed suggest that if researchers opt to adjust the scope of their establishment selections based on employment headcounts, these improvements purely change the range of the difference, rather than addressing the underlying differences and trends over time. However, some differences likely are related to the inclusion of nonemployer statistics for the FAH sector, relative to iCBP. These differences are important for researchers to be aware of when using either dataset.

Figure 10
Average percent difference in total State employment between iCBP and NETS by State, for FAH industries, dropping those establishments with less than 2, 5, and 10 employees

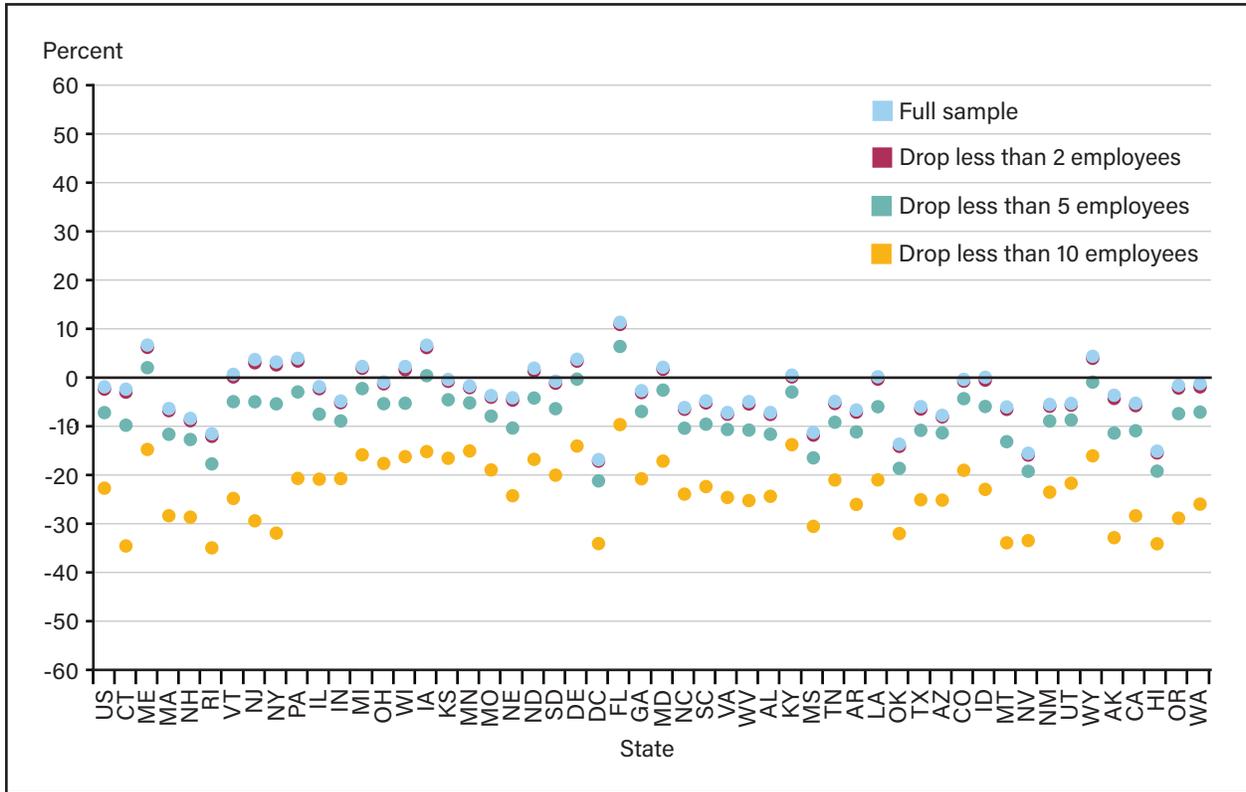


Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAH = food at home. States are identified by United States Postal Service abbreviations.

Source: USDA, Economic Research Service using data from NETS and iCBP from Eckert et al. (2021)

Figure 11

Annual percent difference in total State employment between iCBP and NETS by State, for FAFH industries, dropping those establishments with less than 2, 5, and 10 employees



Notes: NETS = National Establishment Time Series; iCBP = imputed County Business Patterns; FAFH = food away from home. States are identified by United States Postal Service abbreviations.

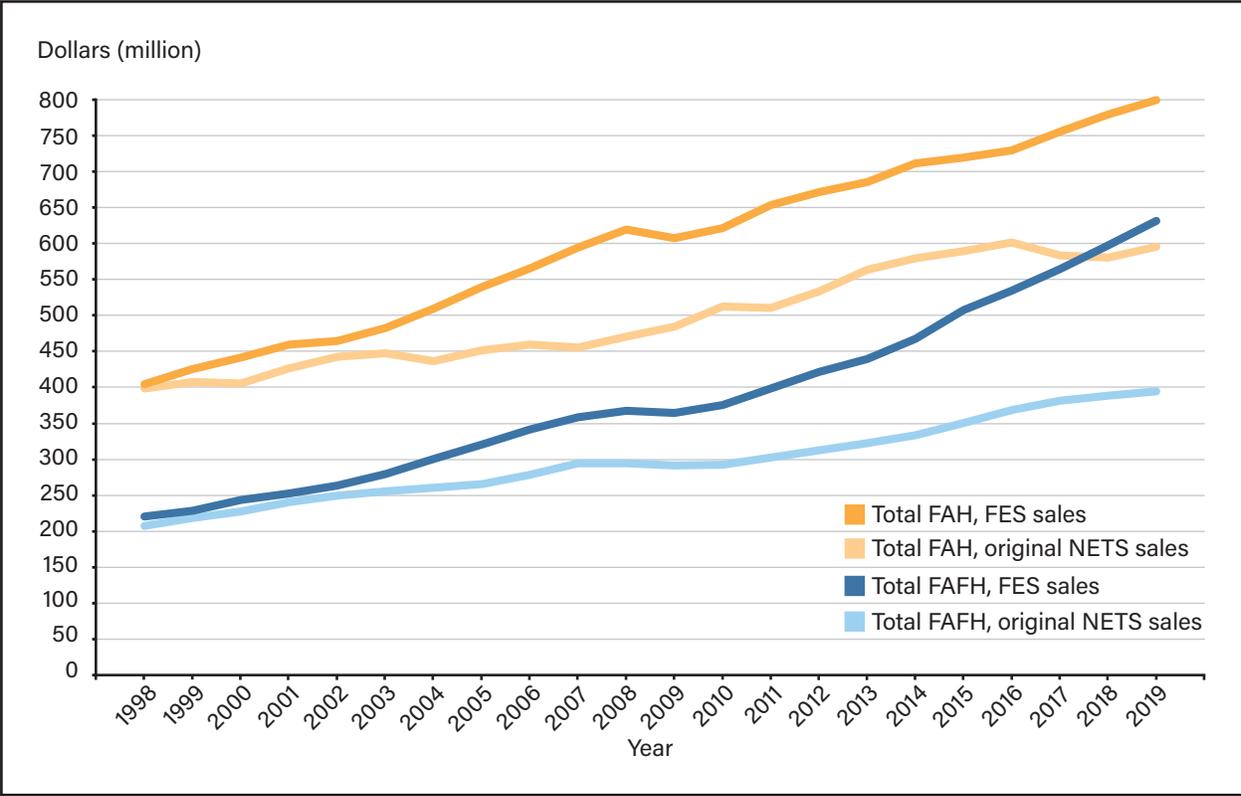
Source: USDA, Economic Research Service (ERS) using data from NETS and iCBP from Eckert et al. (2021)

Results: Sales Estimation

Comparing Sales Data

Sales information was aggregated at the national level by NAICS code for FAH and FAFH establishments in both FES and NETS to compare the two datasets with each other. First, results comparing overall total sales for both FAH and FAFH establishments in NETS and FES are presented for each year in the sample at the national level (figure 12). Results show that NETS estimates relatively lower total sales for FAH establishments for all years relative to FES—a difference that widened over time. Moreover, results show that NETS also estimates lower total sales relative to FES for FAFH establishments—widening even more than in the case of FAH over time.

Figure 12
Annual total U.S. sales in FES and NETS, for FAH and FAFH industries



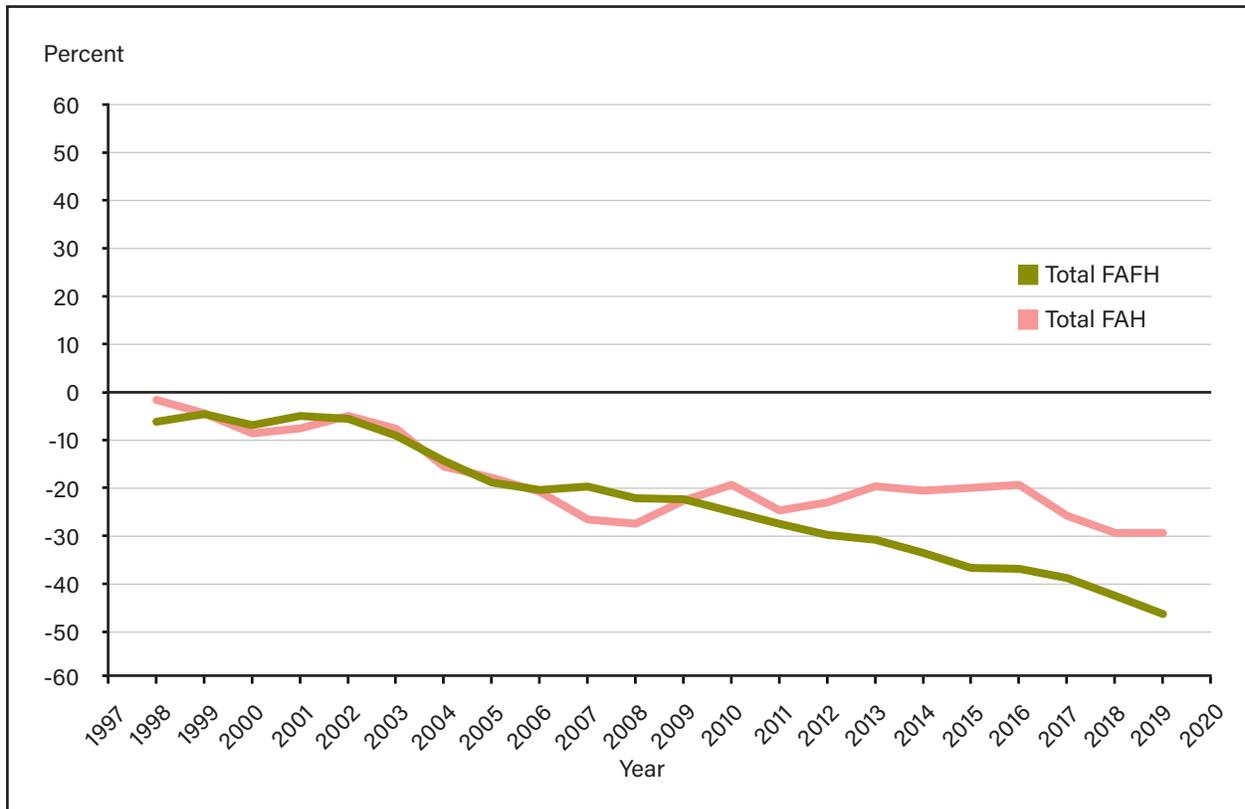
Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

In exploring the percent difference between the two datasets for FAH and FAFH (figure 13), NETS estimates that total sales are generally lower in FAH than FES, with the percent difference increasing over time from less than 10 percent in the early 2000s to almost 30 percent in 2019. For FAFH, results show a similar pattern with the percent difference increasing from less than 10 percent in the early 2000s to almost 50 percent in 2019.

Figure 13

Annual percent difference in total sales between FES and NETS, for FAH and FAFH industries



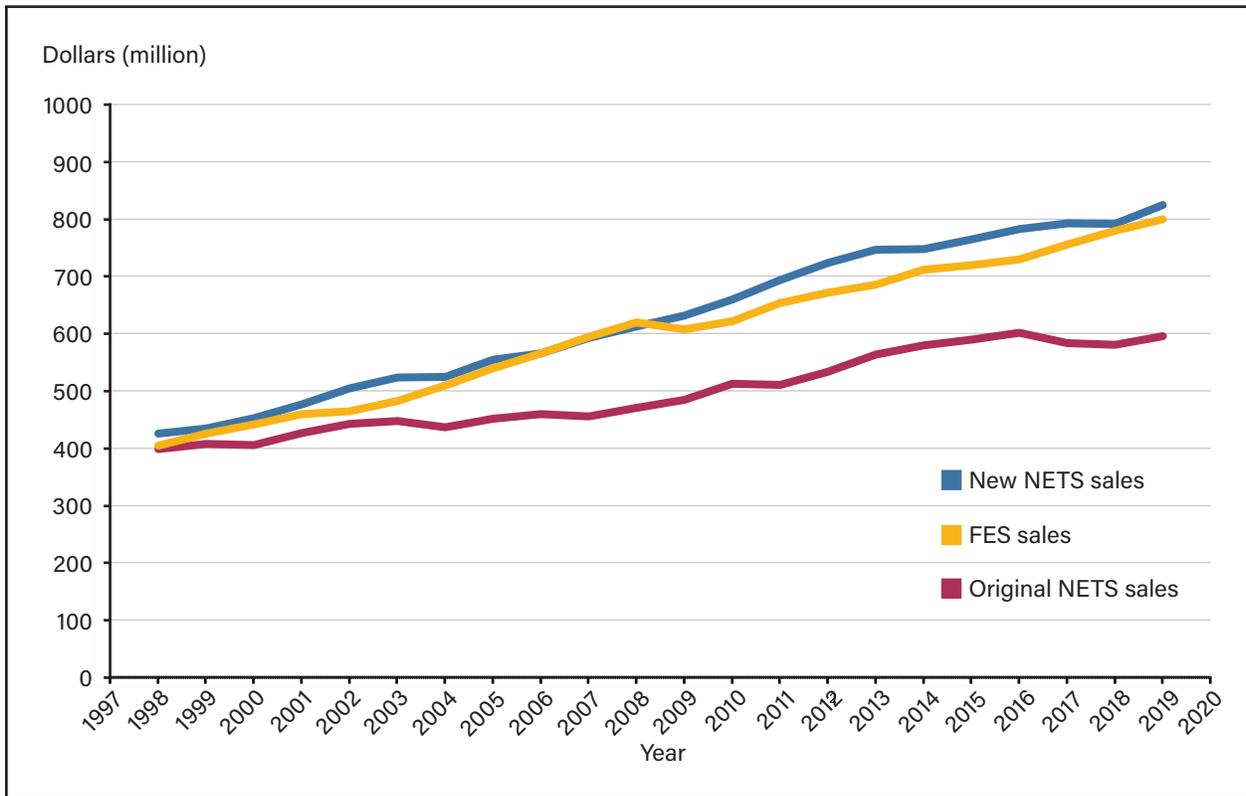
Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

After adjusting sales in NETS with the establishment-level ratio and comparing the newly estimated total sales for FAH and FAFH in NETS with FES, results show the newly estimated food sales present similar patterns and trends as the aggregate sales observed in FES (figures 14A and 14B). In addition, results show that the newly estimated NETS sales present similar trends in the FAH industry but consistently estimate relatively higher total sales for all years in the sample. This may be because NETS reports a relatively higher number of employees in some subcategories of the FAH industry (e.g., specialty food stores) than other Federal records. Results show similar trends and total sales in the case of the FAFH industry, with an increased tendency of relatively higher sales starting in 2015.

Figure 14A

Annual total U.S. sales in FES, NETS, and newly estimated NETS sales, for FAH industry

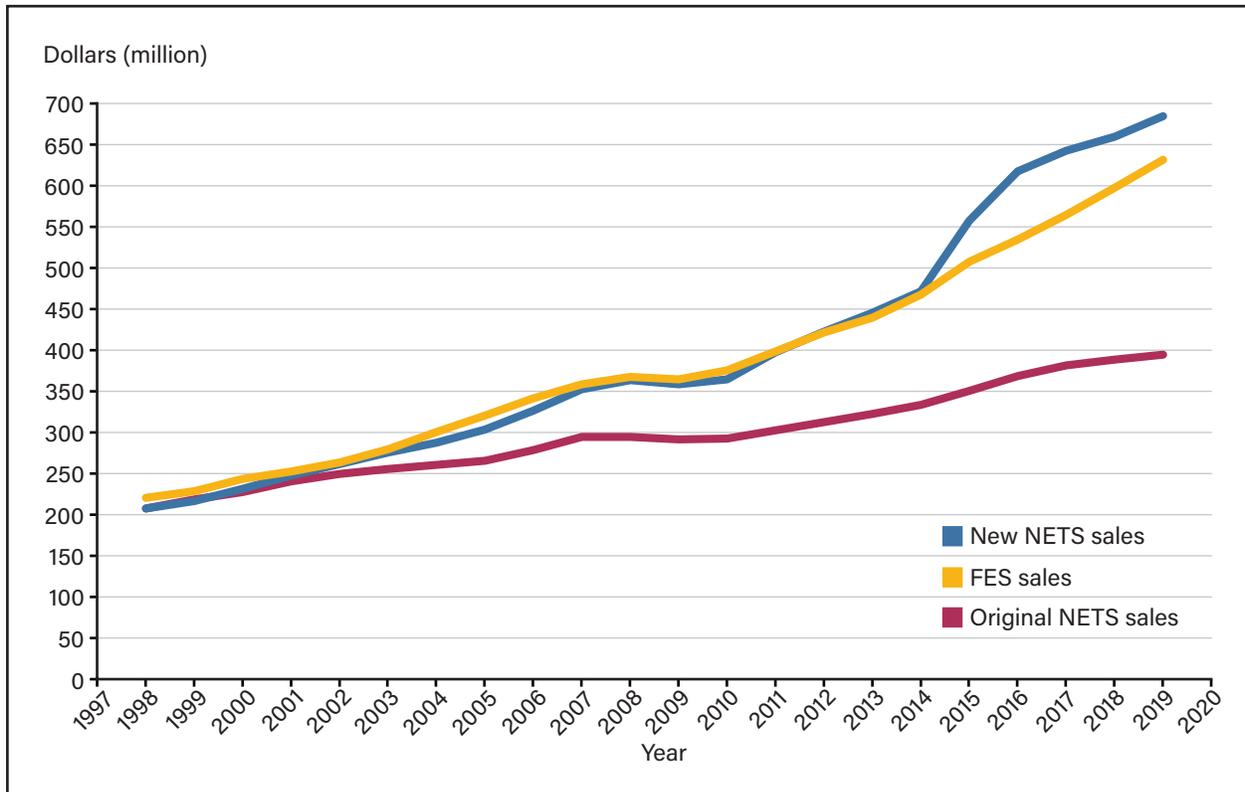


Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAH = food at home.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

Figure 14B

Annual total U.S. sales in FES, NETS, and newly estimated NETS sales, for FAFH industry



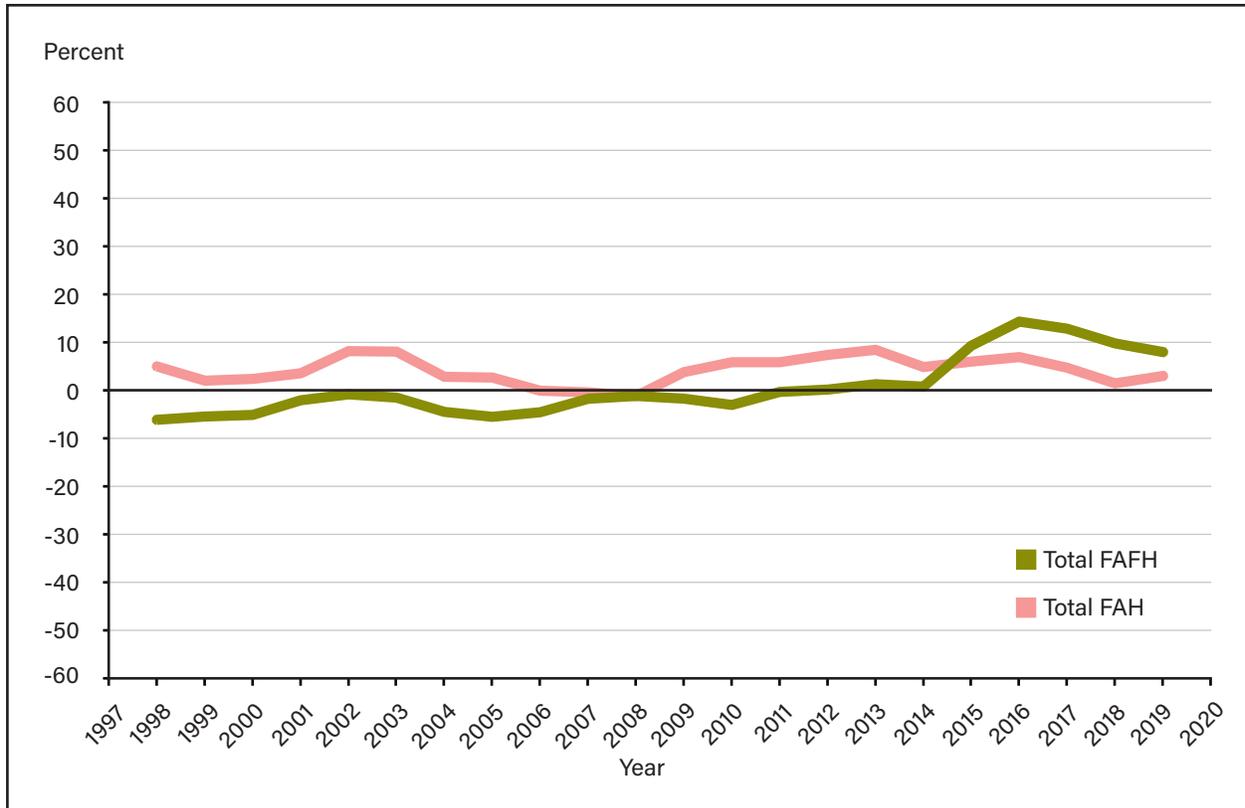
Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAFH = food away from home.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

In exploring the percent difference between FES estimates and the newly estimated NETS sales data for both FAH and FAFH (figure 15), results show that the newly estimated NETS sales for FAH are higher than FES sales over time but lower than 10 percent and 3 percent in 2019. For FAFH, the newly estimated NETS sales data are about 7 percent below FES in 1997, but the gap narrows to zero in 2012, and by 2019, the newly estimated NETS sales for FAFH are 8 percent higher than FES.

Figure 15

Annual percent difference between the newly estimated total U.S. NETS sales and FES, for FAH and FAFH industries



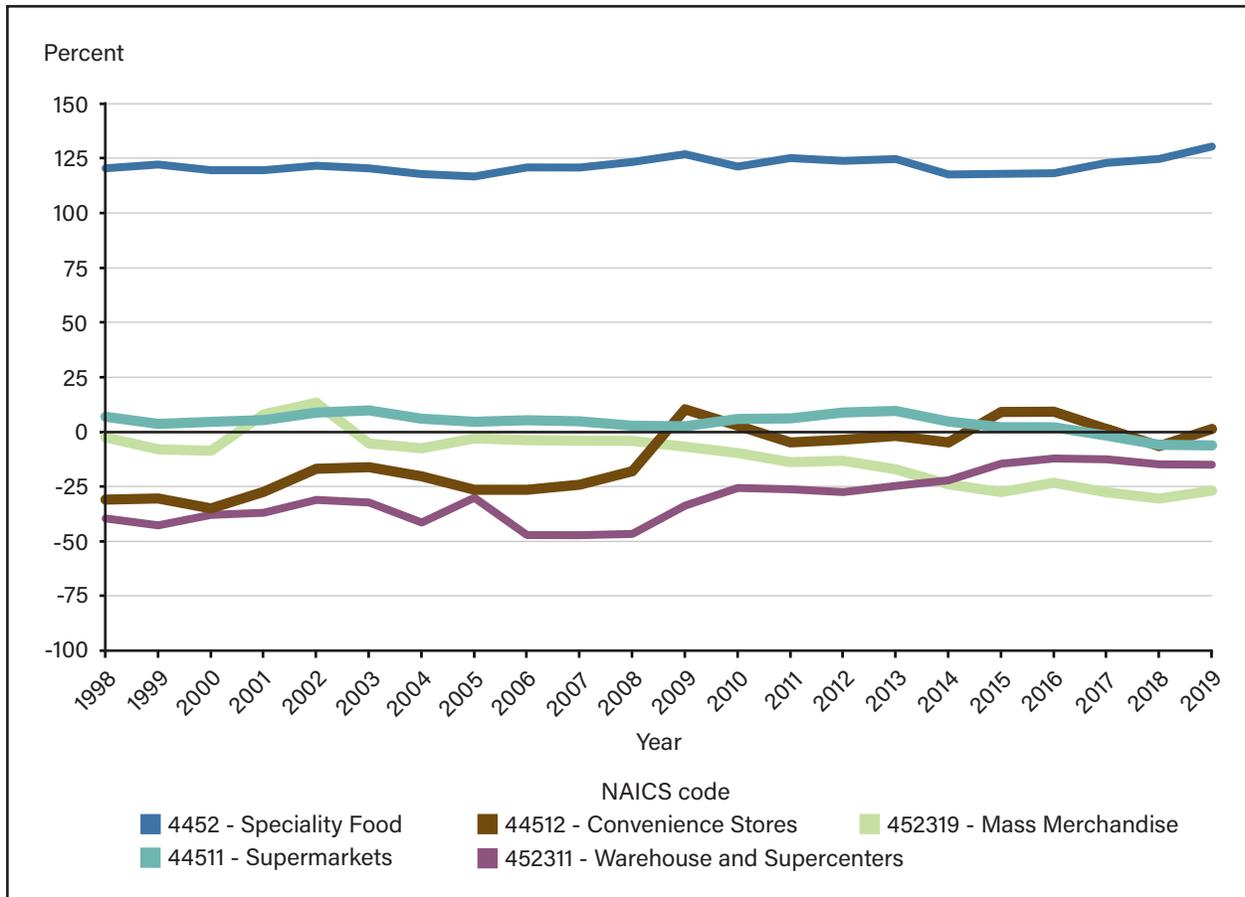
Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAH = food at home; FAFH = food away from home.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 Food Expenditure Series and the National Establishment Time Series.

In comparing newly estimated total sales in NETS with sales from FES for the different FAH categories, more variability exists across the different sectors, which includes Supermarkets, Convenience Stores, Warehouses and Supercenters, Mass Merchandisers, and Specialty Food Vendors (figure 16). Supermarkets show the lowest percent difference in newly estimated sales, ranging between -6 and 10 percent for most of the sample period. Mass merchandisers are the sector with the second lowest percent difference in newly estimated sales, ranging between -30 percent in 2018 and 13 percent in 2002. Notably, NETS newly estimated sales at warehouse and supercenters improved over time (i.e., the percent difference shrank across the two datasets), from -47 percent in 2007 to 12 percent in 2016. Similar patterns are presented for convenience stores, hovering around 0 percent since 2010. Similar to employment findings, results showed newly adjusted sales in NETS to be relatively higher for specialty food stores compared to FES.

Figure 16

Annual percent difference between the newly estimated total U.S. NETS sales and FES, for FAH industry



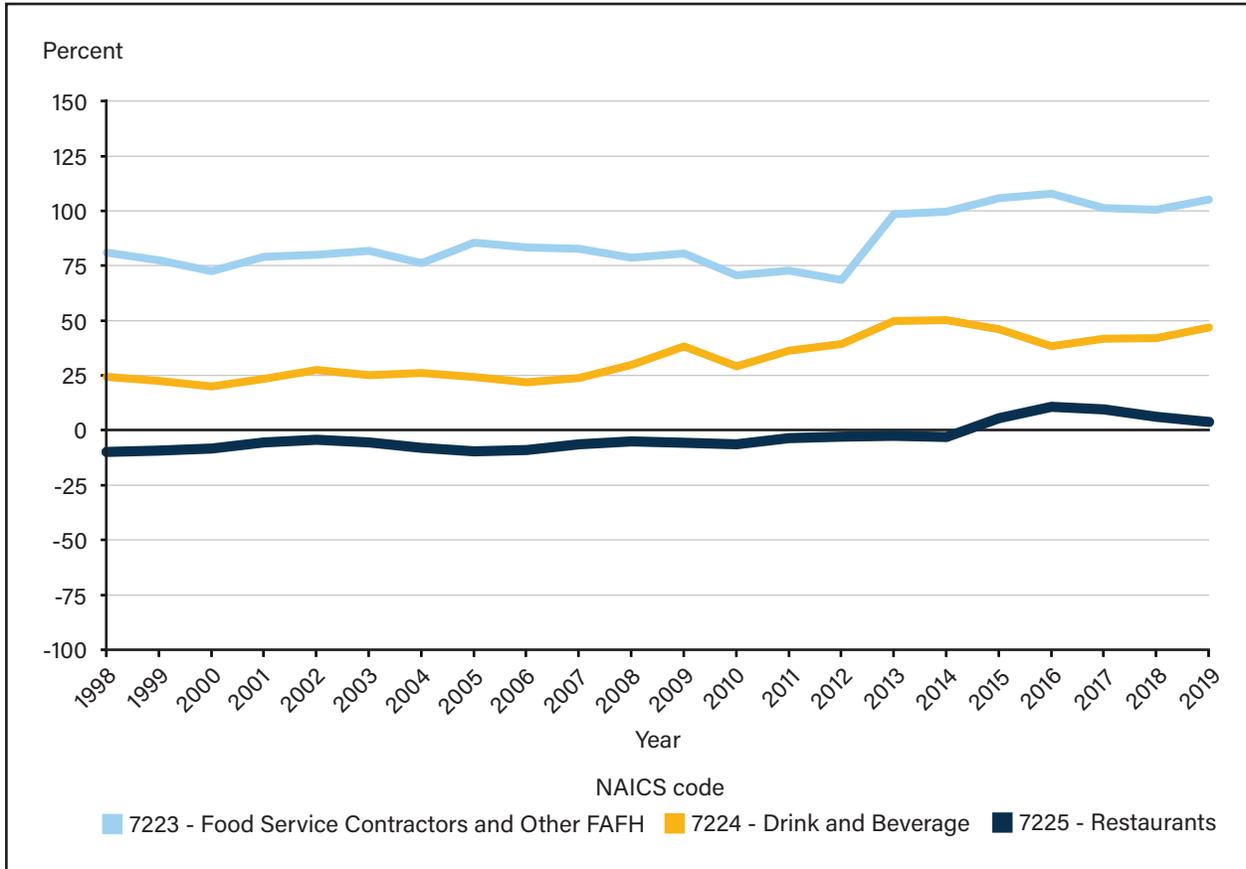
Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAH = food at home; NAICS = North American Industry Classification System.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

Figure 17 shows the broader categories for FAFH: restaurants (combination of LSRs and FSRs), drink and beverage stores, and other FAFH stores. Results show little difference between newly estimated NETS sales and FES sales for the restaurant industry—ranging between -11 and 11 percent for most of the sample. In general, the newly estimated sales in NETS at restaurants are similar to sales in FES, while newly estimated sales in NETS are relatively higher compared with FES for the other two categories: drinking places and food service contractors and other FAFH. However, the trends are relatively flat in all three cases, with a slight increase since 2013.

Figure 17

Annual percent difference between the newly estimated total U.S. NETS sales and FES, for FAFH industry



Note: NETS = National Establishment Time Series; FES = Food Expenditure Series; FAFH= food away from home; NAICS = North American Industry Classification System.

Source: USDA, Economic Research Service (ERS) using data from the USDA, ERS 2020 FES and NETS.

Conclusion

This report helps provide context to the retail food environment and its dynamics as captured by NETS, a proprietary dataset purchased by USDA, ERS for economic research. It assesses how well NETS employment and sales information compares with the iCBP and FES. In general, findings suggest the overall employment reported in the FAH and FAFH sector is reasonably consistent between NETS and iCBP, particularly for the largest contributors—supermarkets and restaurants. While sales information in NETS was lower than FES, using the employment data from NETS with the sales and employment information from EC, the sales information in NETS was re-estimated. These results showed newly estimated sales derived from the employment data of NETS was consistent with the FES.

When comparing NETS to iCBP, NETS reported only slightly lower total employees for FAH establishments. The average percent difference between the two datasets across the years was -4 percent. The largest component of the FAH sector, supermarkets, is consistently represented by NETS relative to the iCBP throughout most of the sample. On average, a 5-percent difference exists in national supermarket employment between NETS and iCBP. Mass merchandise retailers are the only other FAH sector to report an average percent difference less than 10 percent—in absolute value—in employment throughout the sample.

For FAFH establishments, NETS employment is similar to the employment reported in iCBP—with the average percent difference across years at -2 percent. As observed for the employment of the largest sector of FAH, the largest portion of FAFH, restaurants, is also well represented by NETS throughout most of the sample (average -1 percent difference). It should be noted, however, that when restaurant type is separated (FSRs versus LSRs), there are notable differences in the percent difference across the two datasets for these subcategories, likely due to classification differences. These findings suggest that differences may exist in NAICS classification for various establishments in the FAFH sector across datasets, which may be of interest to researchers.

When differences are investigated between NETS and the iCBP after eliminating firms of various employment size, as discussed in Barnatchez et al. (2017), results show that NETS is capturing more of those small establishments than any of the Federal datasets. When removing FAH establishments with fewer than two employees, the percent difference between NETS and iCBP typically remains between -10 and 3 percent for most years. While the difference between the two datasets appears to shrink, it should be noted that the change generally only modifies the range of results and does not impact the overall trends that are important when analyzing changes over time. This difference is important for research conducted related to nonemployer establishments.

Since 2000, the total share of food expenditures for nontraditional food retailers like dollar stores, drug stores, and supercenters have seen an increase from 14 percent in 2002 to 22 percent in 2011 (USDA, ERS, 2022b). Employment data and the newly estimated sales data from NETS for warehouses and supercenters, an increasingly popular FAH retail outlet for U.S. households, saw increased values relative to both CBP and FES since 2010 (Ver Ploeg et al., 2015; Volpe et al., 2017). This highlights the value of a reoccurring annual database like NETS for capturing key indicators from the food retail sector.

After identifying the differences in employment reported between NETS and iCBP and understanding the accuracy of employment data in NETS, this report provides a new estimation strategy to capture sales more accurately in NETS. The developed employee/sales ratio generated relatively consistent sales estimates for supermarkets and restaurants compared with FES. These categories are the largest contributors to FAH and FAFH expenditures, at about 60 and 70 percent, respectively, of total expenditures in 2019. Generally, the newly estimated NETS sales for the whole food retail environment, although higher than FES, are

comparable with trends found in FES. The newly estimated NETS sales tend to be higher for those industries that comprise a smaller share of food expenditures, specifically, specialty food stores, food service contractors, and other FAFH and drinking places, which comprise less than 10 percent of overall food expenditures in 2019 for their respective food retail categories.

Although estimates between the newly estimated NETS sales aggregated at the national level and the FES are not equivalent, these estimates do provide researchers with an upper bound on total available sales information for the various sectors studied that show a similar trend as FES. Moreover, although direct comparisons between the newly estimated NETS sales and FES at the State level are not possible—based on the accuracy and similarities between NETS and iCBP in employee headcount at the State level—the newly estimated NETS sales at the State level may reflect similar trends over time. This approach is limited in scope given the specific data available for the food environment. The newly estimated NETS sales do not capture productivity differences across establishments within the same NAICS code and State (i.e., an establishment may sell more per employee than other establishments in the same sector). However, the findings presented here provide a baseline for research in the food retail sector using NETS employment and sales information, based on data in NETS and official records (iCBP and EC) for the food retail sector.

In recent years, NETS is frequently and increasingly being used by researchers to answer questions about the dynamics of the food environment at a more localized level that are critical for USDA and other key stakeholders. To that end, understanding its limitations and accuracy relative to Federal datasets is important for future work. In this report, these datasets were compared to NETS, a high-frequency longitudinal database of establishments. Like all datasets, there are shortcomings, often related to imputation. However, NETS is able to provide employment, sales, and establishment counts at various geographies and frequency. By comparing NETS with Federal datasets, this report provides a benchmark understanding of NETS in terms of the food retail environment and a framework for a new methodology to calculate sales that is more in line with national-level estimates of food sales. The results presented in this report are meant to provide additional methods when using firm-level sales data in NETS related to the retail food environment, given the high percentage of imputed values identified by other researchers (Barnatchez et al., 2017; Crane and Decker, 2019). Finally, this report helps to better understand the limitations of Federal data and NETS.

References

- Artz, G. M., Y. Kim, P.F. Orazem, and P.J. Han. 2021. "Which Small Towns Attract Start-Ups and Why? Twenty Years of Evidence From Iowa," *American Journal of Agricultural Economics* 103(2):702–720.
- Barnatchez, K., L. Crane, and R. Decker. 2017. *An Assessment of the National Establishment Time Series (NETS) Database*, Finance and Economics Discussion Series 2017-110. Board of Governors of the Federal Reserve System, Washington, DC.
- Cho C., P.W. McLaughlin, E. Zeballos, J. Kent, and C. Dicken. 2019. *Capturing the Complete Food Environment With Commercial Data: A Comparison of TDLinx, ReCount, and NETS Databases*, TB-1953, U.S. Department of Agriculture, Economic Research Service.
- Choi, T., J. C. Robertson, and A. Rupasingha. 2013. *High-Growth Firms in Georgia*, Working Paper, No. 2013-20, Federal Reserve Bank of Atlanta, Atlanta, GA.
- Crane, L.D., and R.A. Decker. 2019. *Business Dynamics in the National Establishment Time Series (NETS)*, Finance and Economics Discussion Series 2019-034, Board of Governors of the Federal Reserve System, Washington, DC.
- Drucker, J., G. Kim, and R. Weber. 2019. "Did Incentives Help Municipalities Recover From the Great Recession? Evidence From Midwestern Cities," *Growth and Change* 50(3):894–925.
- Eckert F., T.C. Fort, P.K. Schott, and N.J. Yang. 2021. *Imputing Missing Values in the U.S. Census Bureau's County Business Patterns*, Working Paper #26632, National Bureau of Economic Research, Cambridge, MA.
- Evans, T., L. Zayatz, and J. Slanta. 1998. "Using Noise for Disclosure Limitation of Establishment Tabular Data," *Journal of Official Statistics* 14(4):537.
- Kunkle, G. 2011. *Business Establishment Employment Data: Nets Versus ES-202*, Edward Lowe Foundation's Institute for Exceptional Growth Companies.
- Low, S.A., M. Bass, D. Thilmany, and M. Castillo. 2020. "Local Foods Go Downstream: Exploring the Spatial Factors Driving U.S. Food Manufacturing," *Applied Economic Perspectives and Policy* 43(3):896–915.
- Ma, X., S.E. Battersby, B.A. Bell, J.D. Hibbert, T.L. Barnes, and A.D. Liese. 2013. "Variation in Low Food Access Areas Due to Data Source Inaccuracies," *Applied Geography* 45:131–137.
- Neumark, D., J. Zhang, and B. Wall. 2005. *Employment Dynamics and Business Relocation: New Evidence from the National Establishment Time Series*, Working Paper 11647, National Bureau of Economic Research.
- Neumark, D., B. Wall, and J. Zhang. 2011. "Do Small Businesses Create More Jobs? New Evidence for the United States From the National Establishment Time Series," *The Review of Economics and Statistics*, 93(1):16–29.
- The NPD Group, Inc. 2015. "Fall 2015 Release Notes," Internal Document Provided To U.S. Department of Agriculture, Economic Research Service, The NPD Group, Inc., Port Washington, NY.

- Okrent, A.M., H. Elitzak, T. Park, and S. Rehkamp. 2018. *Measuring the Value of the U.S. Food System: Revisions to the Food Expenditure Series*, TB-1948, U.S. Department of Agriculture, Economic Research Service.
- Rossi-Hansberg, E., P.D. Sarte, and N. Trachter. 2021. “Diverging Trends in National and Local Concentration,” *National Bureau of Economic Analysis (NBER) Macroeconomics Annual* 35(1):115–150.
- Stevens, A., C. Cho, M. Çakır, X. Kong, and M. Boland. June 2021. *The Food Retail Landscape Across Rural America*, EIB-223, U.S. Department of Agriculture, Economic Research Service.
- U.S. Department of Agriculture, Economic Research Service. 2022a. *Retail Trends*. U.S. Department of Agriculture, Economic Research Service, Washington, DC.
- U.S. Department of Agriculture, Economic Research Service. 2022b. *Trends in U.S. Food Expenditures*. U.S. Department of Agriculture, Economic Research Service, Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 2012. *2012 NAICS Definition*. U.S. Department of Commerce, Bureau of the Census, Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 2019. *About the Economic Census*. U.S. Department of Commerce, Bureau of the Census, Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 2021. *NAICS Update Process Fact Sheet*. U.S. Department of Commerce, Bureau of the Census, Washington, DC.
- Ver Ploeg, M., L. Mancino, J. Todd, D.M. Clay, and B. Scharadin. 2015. *Where Do Americans Usually Shop for Food and How Do They Travel To Get There? Initial Findings from the National Household Food Acquisition and Purchase Survey*, EIB-138, U.S. Department of Agriculture, Economic Research Service.
- Volpe, R., A. Kuhns, and E. Jaenicke. 2017. *Store Formats and Patterns in Household Grocery Purchases*, EIB-167, U.S. Department of Agriculture, Economic Research Service.
- Walls & Associates. 2019. “National Establishment Time-Series (NETS) Database: 2019 Database Description. Walls & Associates, Oakland, CA.