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Measuring Food Expenditures Smoothing in the U.S. : The Role of Transfers

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Motivation

- How consumers smooth their food expenditures—both the extent and the channels—has important implications for policy and enriching economic literature, especially in relation to food security.
- During economic downturns, households often reallocate their spending away from non-food items and dining out (food-away-from-home, or FAFH) to preparing meals at home (food-at-home, or FAH).
- Additionally, private savings and government transfers can help stabilize household food expenditures, though impacts can vary across different states. These disparities are often a result of regional economic conditions.
- By examining these dynamics, we can gain valuable insights that can inform policy options to enhance household food security.

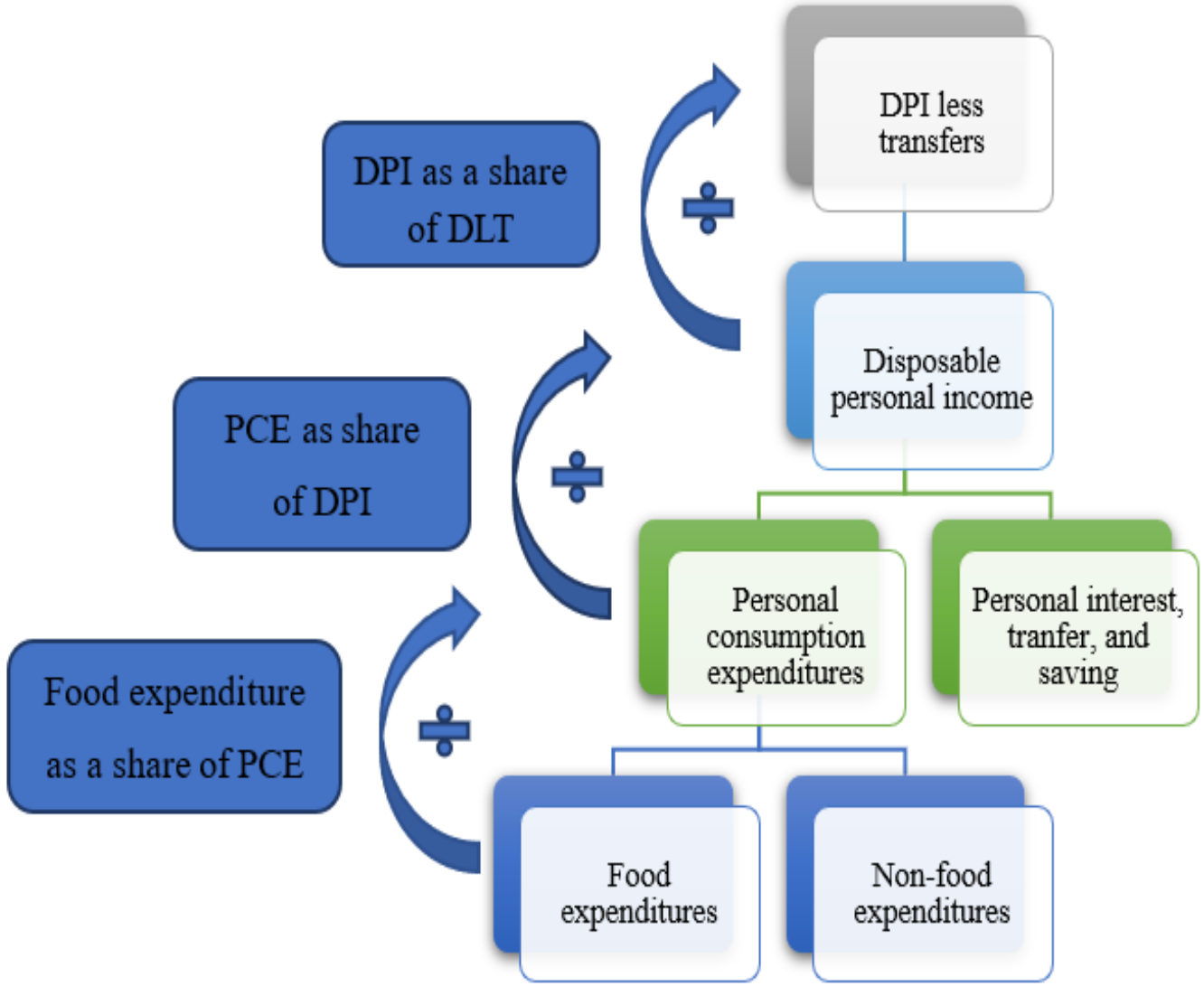
What do we do?

- We begin by examining the relationship between state-level variations in income and corresponding variations in food expenditures.
  - Our analysis distinguishes between food at home (FAH) and food away from home (FAFH) expenditures.
  - We compare this relationship across recessionary and non-recessionary periods,
  - as well as across states that receive higher versus lower levels of public transfers from federal, state, and local programs.

What do we do?

- We then identify how changes in food spending are smoothed through the various channels in the food spending chain decomposition.
- Our analysis spans the years 1998 to 2023 and focuses on the following key channels:
  - **Income (Before Transfers):** How does a shock to income affect food spending decisions?
  - **Government Transfers:** In what ways do government assistance programs help stabilize food expenditure?
  - **Spending vs. Saving Preferences:** What are the households' tendencies to spend versus save?
  - **Food vs. Non-Food Expenditure:** How is discretionary spending divided between food and non-food items?
- By isolating the effects of government transfers, we aim to provide valuable insights into their role in stabilizing food spending across different states.

Food spending chain decomposition

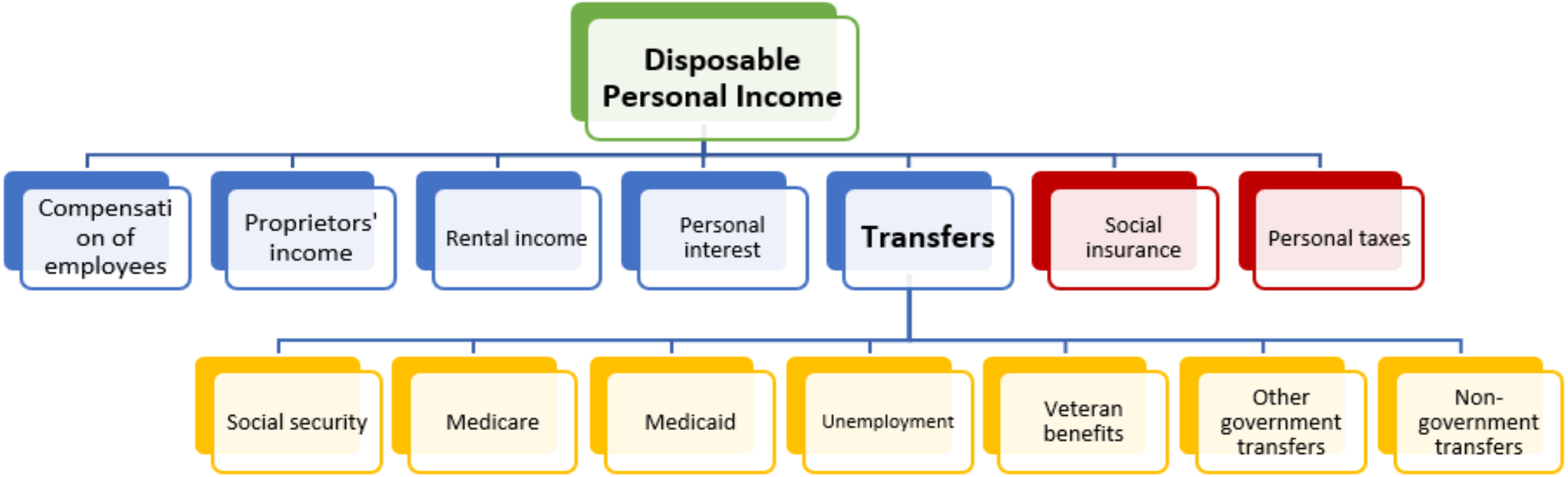


Note: PCE = personal consumption expenditures; DPI = disposable personal income; DLT = disposable personal income less transfers.
Source: USDA, Economic Research Service.

Data and sources

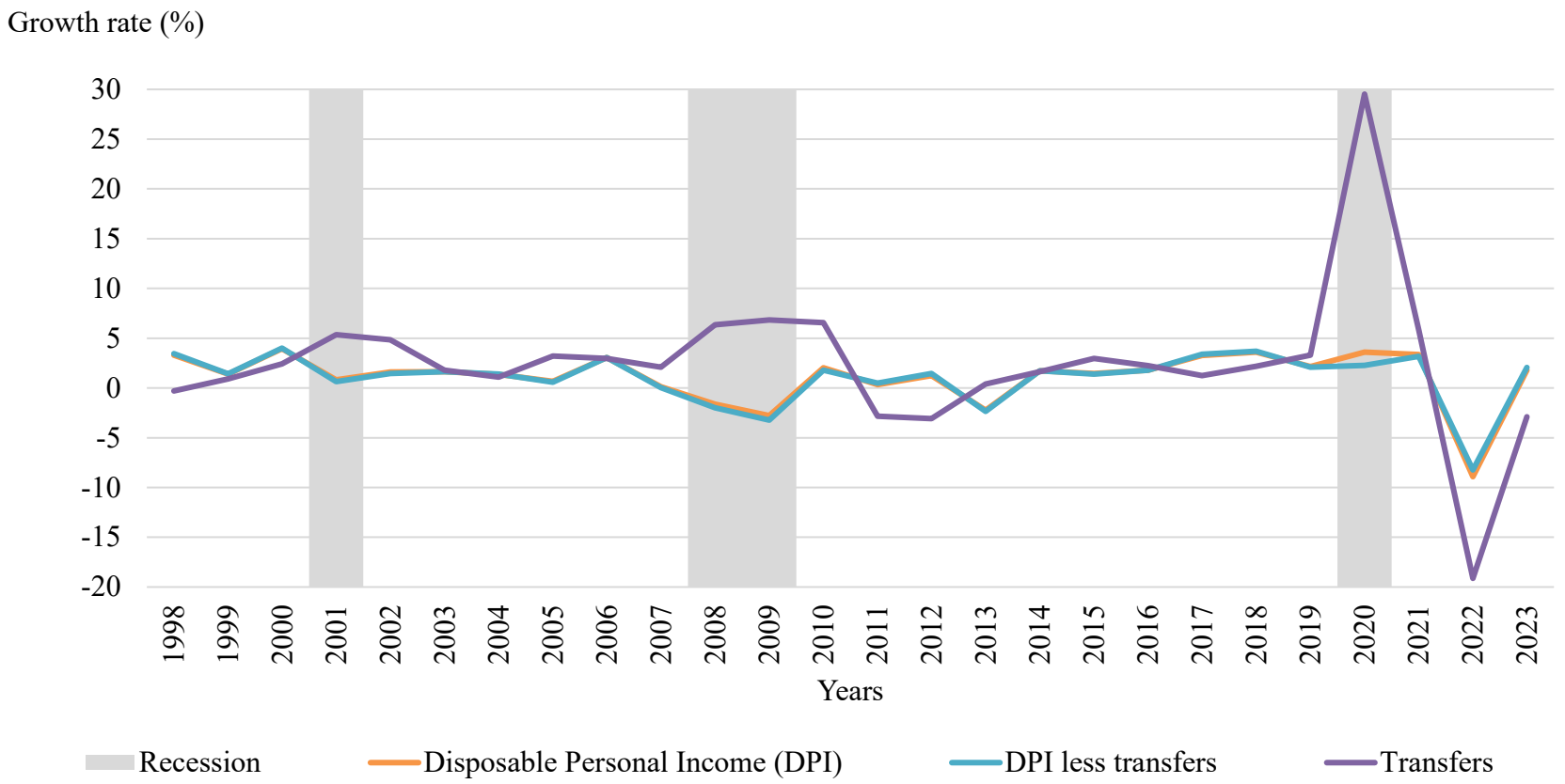
Disposable personal income (DPI)	Transfers	Personal Consumption Expenditures (PCE)	Total food expenditures (TFE)
• The amount of money that households have available for spending and saving after income taxes. • Source: U.S. Department of Commerce, Bureau of Economic Analysis.	• The amount of money paid by government to individuals and nonprofit institutions for which no services are performed. • Source: U.S. Department of Commerce, Bureau of Economic Analysis.	• Value of consumer spending on all goods and services. • Source: U.S. Department of Commerce, Bureau of Economic Analysis.	• Value of the total food acquired in the United States. • TFE = food at home + food away from home • Source: USDA, Economic Research Service (ERS) Food Expenditure Series (FES).

Transfers as a portion of income



Note: Income components shaded in blue count towards DPI while components shaded in red subtract from DPI.
Source: USDA, Economic Research Service using data from the U.S. Department of Commerce, Bureau of Economic Analysis.

Growth of personal disposable income and transfers in the U.S.



Note: DPI = disposable personal income. Constant dollar sales (2023=100). 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.

Empirical approach: Basic regression

We employ a standard risk-sharing regression model informed by established literature on the implications of the consumption Euler Equation (Zeldes 1991; Obstfeld 1993; Lewis 1996).

$$\Delta c_{t+1}^{j} - \Delta c_{t+1} = \alpha + \boldsymbol{\beta}(\Delta y_{t+1}^{j} - \Delta y_{t+1}) + \epsilon_{t+1}^{j}$$

- Δc_{t+1}^{j} (Δy_{t+1}^{j}) denotes state j food consumption (income) per capita growth at time $t+1$;
- Δc_{t+1} (Δy_{t+1}) denotes US food consumption (income) per capita growth at time $t+1$;
- ϵ_{t+1}^{j} follows a stationary process and represents measurement error in consumption; and
- $\boldsymbol{\beta}$ **measures the extent of risk sharing** (Asdrubali et al., 1996; Kose et al., 2009)

Empirical approach: Heterogenous effects

To analyze the effect of recessions, we specifically analyze their impact on the comovement between state-specific food consumption and income levels:

$$\Delta c_{t+1}^{j} - \Delta c_{t+1}$$
$$= \gamma_1 \boldsymbol{Rec_t} (\Delta y_{t+1}^{j} - \Delta y_{t+1}) + \boldsymbol{\gamma_2} (\mathbf{1} - \boldsymbol{Rec_t}) \left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right) + \epsilon_{t+1}^{j}$$

- Rec_t is a dummy variable that represents a recessionary period at time t.
- If $\boldsymbol{\gamma_1} > \boldsymbol{\gamma_2}$ suggests that the sensitivity of state-specific food consumption growth to state-specific income fluctuations is higher during recessionary periods,
- **and thus, is associated with less food consumption smoothing.**

Empirical approach: transfers

Finally, to analyze the effect of recessions for states with different levels of income or transfers, we specifically analyze their impact on the comovement between state-specific food consumption and income levels:

$$\Delta c_{t+1}^{j} - \Delta c_{t+1}$$
$$= \boldsymbol{\delta_1 Rec_t I_{jt}}(\Delta y_{t+1}^{j} - \Delta y_{t+1}) + \boldsymbol{\delta_2}(\mathbf{1} - \boldsymbol{Rec_t})\boldsymbol{I_{jt}}\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right) + \delta_3 \boldsymbol{Rec_t}(\mathbf{1} - \boldsymbol{I_{jt}})(\Delta y_{t+1}^{j} - \Delta y_{t+1})$$
$$+ \boldsymbol{\delta_4}(\mathbf{1} - \boldsymbol{Rec_t})(\mathbf{1} - \boldsymbol{I_{jt}})\left(\Delta y_{t+1}^{j} - \Delta y_{t+1}\right) + \epsilon_{t+1}^{j}$$

- I_{jt} represents a dummy equal to 1 if transfers-to-income of state j at time t is above the median.
- If $\boldsymbol{\delta_1} < \boldsymbol{\delta_3}$ suggests that the sensitivity of state-specific food consumption growth to state-specific income fluctuations during recessionary periods is higher among those states above the median transfers-to-income,
- **and thus, is associated with more food consumption smoothing.**

Empirical approach: Estimation method

- Dynamic panel framework
- Generalized least square (GLS) estimates for panel data that allows
  - estimation in the presence of $AR(1)$ autocorrelation within panels
  - cross-sectional correlation and heteroskedasticity across panels (Ostergaard, Sorensen and Yosha 2002)
- US states over the 1998-2023 period, annual level data.

Total food

	(1) OLS & time trends	(2) Fixed effects & time trends	(3) 2-step GLS	(4) OLS & time trends	(5) Fixed effects & time trends	(6) 2-step GLS	(7) OLS & time trends	(8) Fixed effects & time trends	(9) 2-step GLS	(10) OLS & time trends	(11) Fixed effects & time trends	(12) 2-step GLS
Beta	0.15***	0.15***	0.13***									
	(0.034)	(0.035)	(0.014)									
Gamma 1 (non-recessionary period)				0.10**	0.10**	0.08***						
				(0.039)	(0.040)	(0.015)						
Gamma 2 (recessionary period)				0.32***	0.34***	0.27***						
				(0.070)	(0.072)	(0.025)						
(non-recessionary period & income below the median)							0.20***	0.20***	0.13***			
							(0.064)	(0.066)	(0.019)			
(recessionary period & income below the median)							0.42***	0.43***	0.37***			
							(0.111)	(0.115)	(0.043)			
(non-recessionary period & income above the median)							0.030	0.030	0.05**			
							(0.049)	(0.050)	(0.019)			
(recessionary period & income above the median)							0.25***	0.28***	0.24***			
							(0.092)	(0.094)	(0.025)			
(non-recessionary period & transfers below the median)										0.18***	0.17***	0.16***
										(0.033)	(0.033)	(0.023)
(recessionary period & transfers below the median)										0.30***	0.30***	0.28***
										(0.060)	(0.061)	(0.048)
(non-recessionary period & transfers above the median)										0.18***	0.18***	0.13***
										(0.046)	(0.047)	(0.034)
(recessionary period & transfers above the median)										0.19**	0.19**	0.20***
										(0.081)	(0.083)	(0.057)
Observations	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,122	1,122	1,122
Number of States		51	51		51	51		51	51		51	51

Notes: Robust standard errors are reported in parenthesis. Generalized least squares regression model including time fixed effects. Dependent variable: $(\Delta c_{t+1}^{j} - \Delta c_{t+1})$. Income growth: $(\Delta y_{t+1}^{j} - \Delta y_{t+1})$. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively.

Sources: USDA, Economic Research Service

Food at home

	(1) OLS & time trends	(2) Fixed effects & time trends	(3) 2-step GLS	(4) OLS & time trends	(5) Fixed effects & time trends	(6) 2-step GLS	(7) OLS & time trends	(8) Fixed effects & time trends	(9) 2-step GLS	(10) OLS & time trends	(11) Fixed effects & time trends	(12) 2-step GLS
Beta	0.13***	0.14***	0.12***									
	(0.039)	(0.039)	(0.021)									
Gamma 1 (non-recessionary period)				0.12***	0.12***	0.08***						
				(0.044)	(0.045)	(0.024)						
Gamma 2 (recessionary period)				0.18**	0.21**	0.21***						
				(0.080)	(0.081)	(0.040)						
(non-recessionary period & income below the median)							0.25***	0.26***	0.20***			
							(0.073)	(0.074)	(0.033)			
(recessionary period & income below the median)							0.09	0.12	0.17***			
							(0.126)	(0.130)	(0.063)			
(non-recessionary period & income above the median)							0.040	0.040	0.020			
							(0.056)	(0.056)	(0.029)			
(recessionary period & income above the median)							0.24**	0.27**	0.24***			
							(0.105)	(0.106)	(0.050)			
(non-recessionary period & transfers below the median)										0.17***	0.17***	0.16***
										(0.053)	(0.054)	(0.031)
(recessionary period & transfers below the median)										0.28***	0.31***	0.34***
										(0.097)	(0.099)	(0.061)
(non-recessionary period & transfers above the median)										0.24***	0.25***	0.16***
										(0.075)	(0.076)	(0.049)
(recessionary period & transfers above the median)										0.12	0.11	0.08
										(0.132)	(0.135)	(0.088)
Observations	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,122	1,122	1,122
Number of States		51	51		51	51		51	51		51	51

Notes: Robust standard errors are reported in parenthesis. Generalized least squares regression model including time fixed effects. Dependent variable: $(\Delta c_{t+1}^{j} - \Delta c_{t+1})$. Income growth: $(\Delta y_{t+1}^{j} - \Delta y_{t+1})$. *, **, and *** denote statistical significance at 10, 5, and 1 percent levels, respectively.

Sources: USDA, Economic Research Service

Food away from home

	(1) OLS & time trends	(2) Fixed effects & time trends	(3) 2-step GLS	(4) OLS & time trends	(5) Fixed effects & time trends	(6) 2-step GLS	(7) OLS & time trends	(8) Fixed effects & time trends	(9) 2-step GLS	(10) OLS & time trends	(11) Fixed effects & time trends	(12) 2-step GLS
Beta	0.16***	0.16***	0.11***									
	(0.038)	(0.039)	(0.011)									
Gamma 1 (non-recessionary period)				0.08*	0.08*	0.07***						
				(0.043)	(0.045)	(0.014)						
Gamma 2 (recessionary period)				0.41***	0.41***	0.34***						
				(0.078)	(0.081)	(0.028)						
(non-recessionary period & income below the median)							0.14*	0.14*	0.10***			
							(0.072)	(0.074)	(0.019)			
(recessionary period & income below the median)							0.56***	0.55***	0.46***			
							(0.125)	(0.130)	(0.044)			
(non-recessionary period & income above the median)							0.050	0.040	0.06***			
							(0.055)	(0.056)	(0.020)			
(recessionary period & income above the median)							0.29***	0.32***	0.28***			
							(0.104)	(0.106)	(0.032)			
(non-recessionary period & transfers below the median)										0.18***	0.18***	0.14***
										(0.033)	(0.033)	(0.018)
(recessionary period & transfers below the median)										0.30***	0.28***	0.20***
										(0.060)	(0.060)	(0.027)
(non-recessionary period & transfers above the median)										0.12***	0.12**	0.10***
										(0.046)	(0.046)	(0.023)
(recessionary period & transfers above the median)										0.28***	0.28***	0.18***
										(0.081)	(0.082)	(0.042)
Observations	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,326	1,122	1,122	1,122
Number of States		51	51		51	51		51	51		51	51

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Sources: USDA, Economic Research Service

Investigating the channels for food expenditure smoothing

- We employ a Structural Decomposition Analysis that is used to breakdown the changes in food spending into several defined factors:

$$Food\ Sales_{ts} = \frac{Food\ Sales_{ts}}{PCE_{ts}} * \frac{PCE_{ts}}{DPI_{ts}} * \frac{DPI_{ts}}{DPI_{ts} - Transfers_{ts}} * (DPI_{ts} - Transfers_{ts})$$

Propensity to spend on food vs. non-food

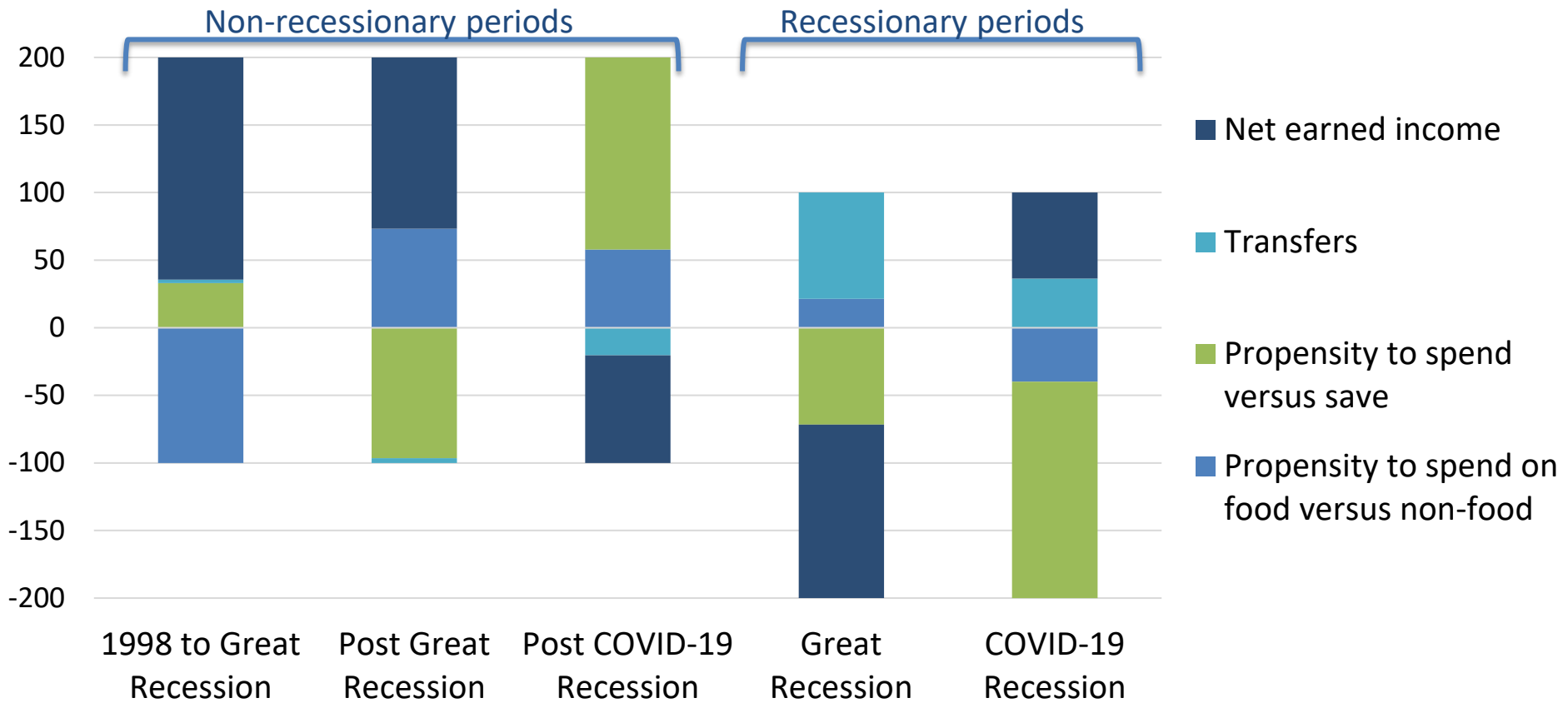
Propensity to spend vs. save

Effect of Transfers

The income effect

Results - National

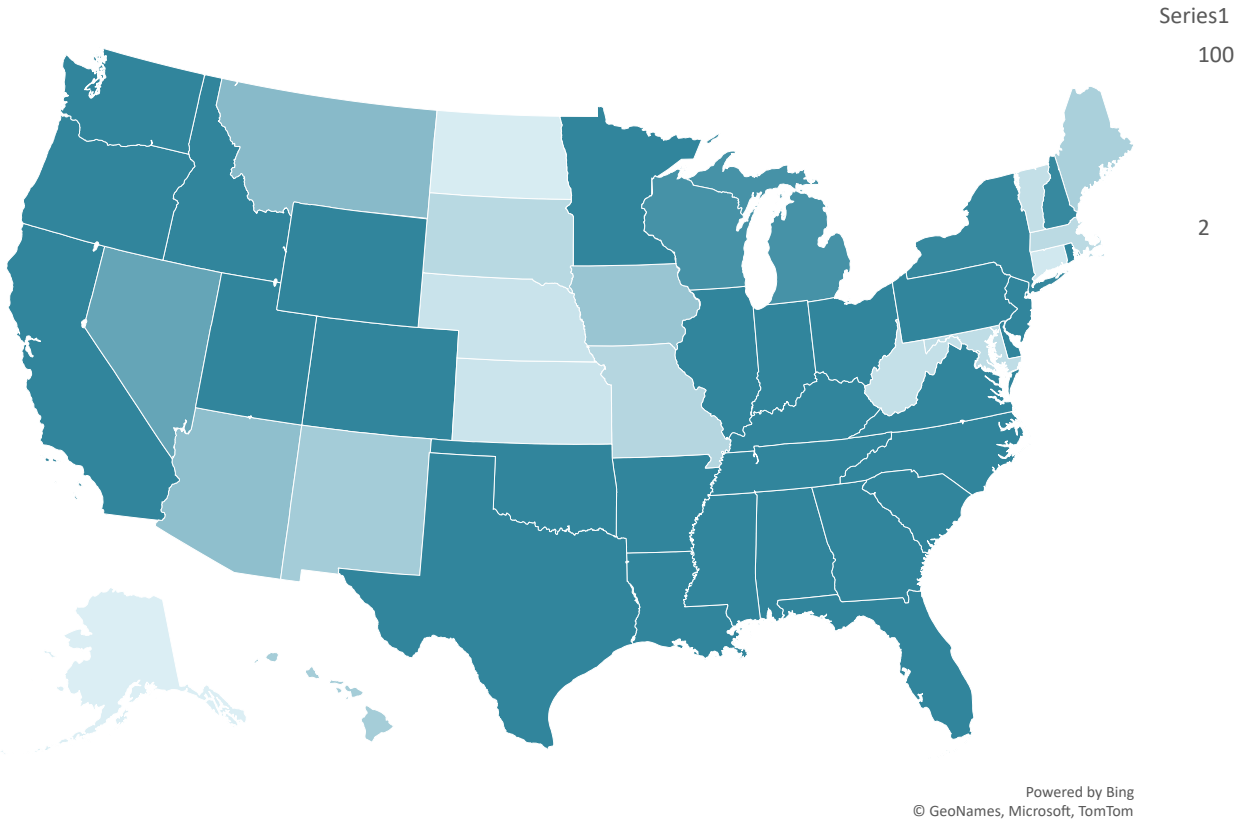
Contribution of each component to changes in aggregate total food spending, by period



Note: Changes in total food spending are based on constant dollar sales (2023=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 = 1998 to 2007; Post-Great Recession = 2010 to 2019; Post-COVID-19 Recession = 2021 to 2023; Great Recession = 2008 to 2009; COVID-19 Recession = 2020.
Source: USDA, Economic Research Service.

Great Recession

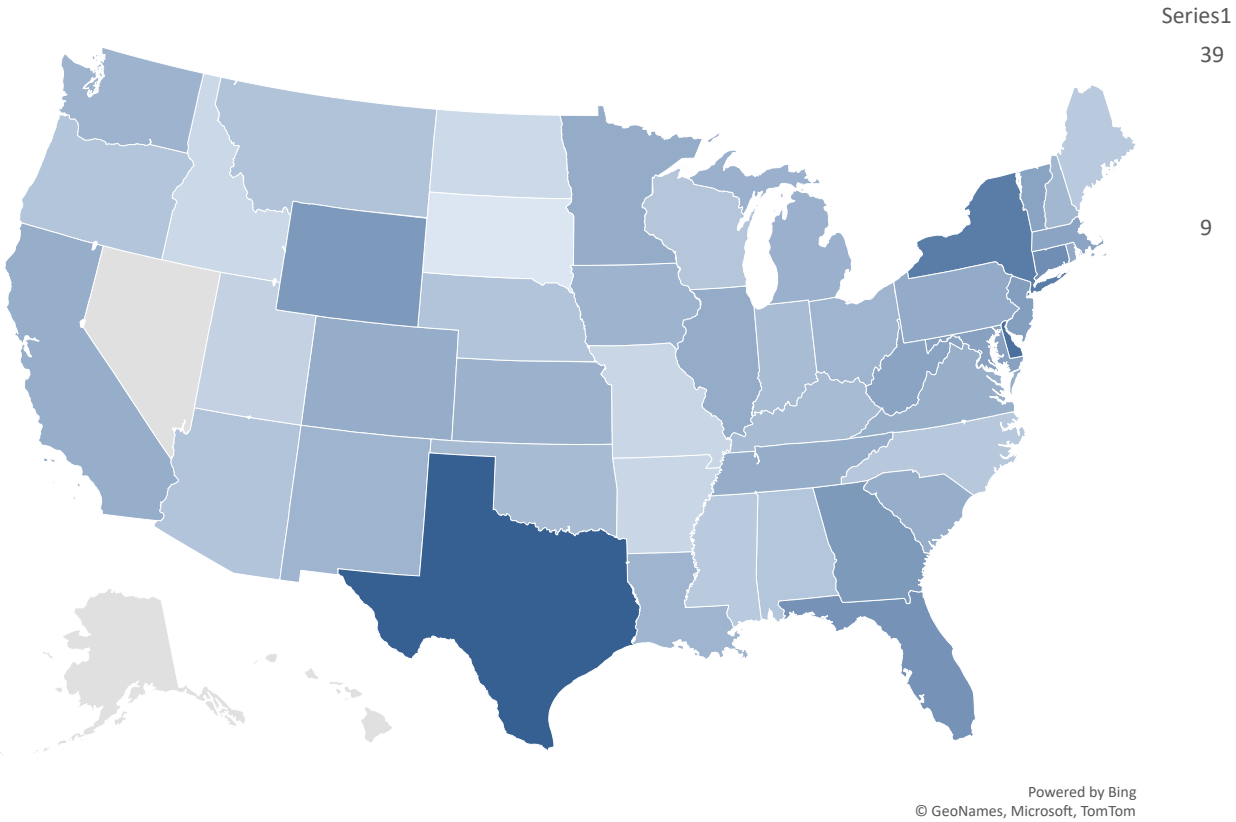
Contribution of transfers during the Great Recession, by State



Note: Changes in total food spending are based on constant dollar sales (2023=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 = 1998 to 2007; Post-Great Recession = 2010 to 2019; Post-COVID-19 Recession = 2021 to 2023; Great Recession = 2008 to 2009; COVID-19 Recession = 2020.
Source: USDA, Economic Research Service.

Covid-19 Recession

Contribution of transfers during the Covid-19 Recession, by State



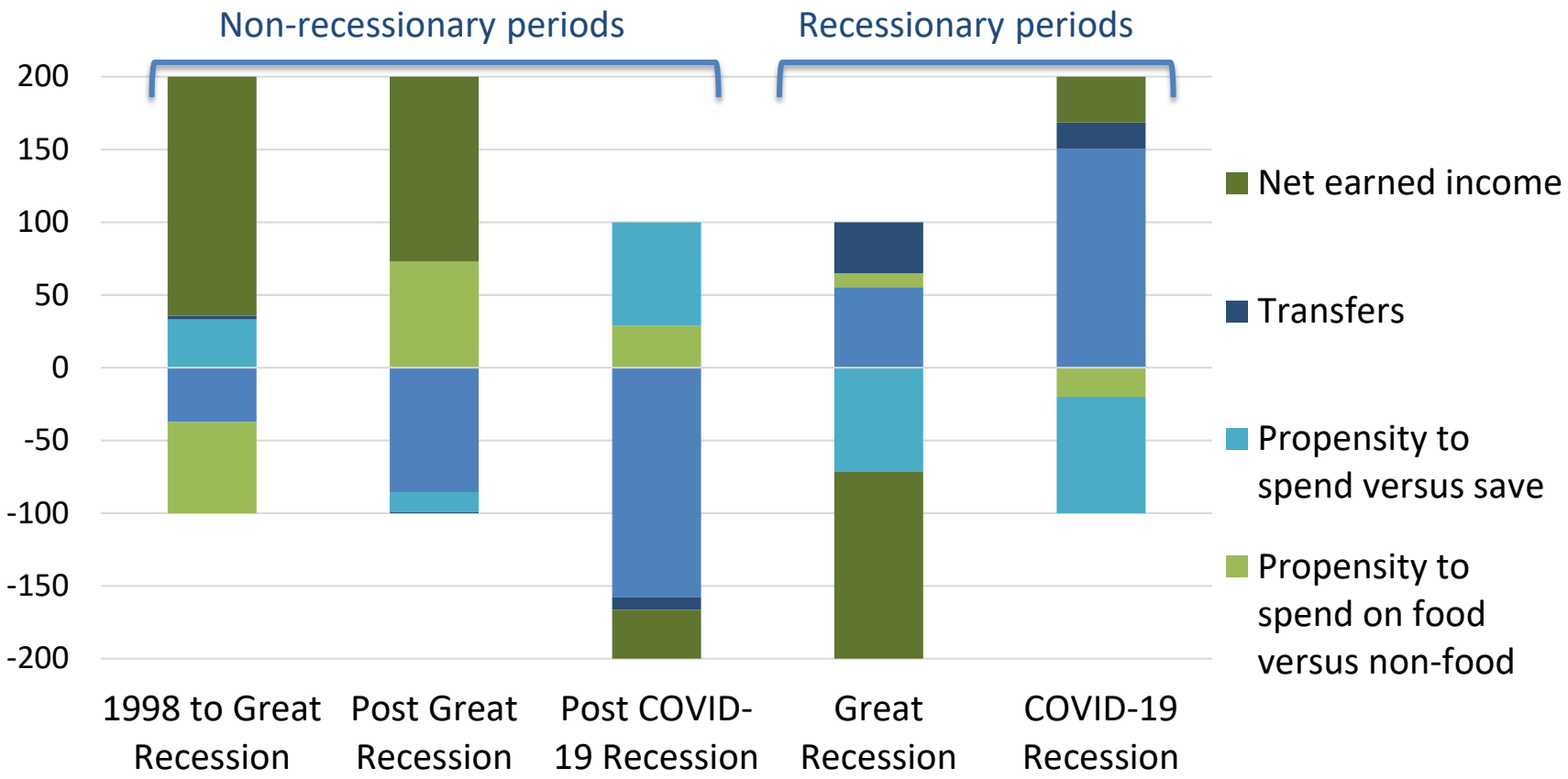
Note: Changes in total food spending are based on constant dollar sales (2023=100) per capita. Food sales data exclude food that is furnished and donated, home-produced, and served at educational institutions. Time periods: 1998 to Great Recession = 1998 to 2007; Post-Great Recession = 2010 to 2019; Post-COVID-19 Recession = 2021 to 2023; Great Recession = 2008 to 2009; COVID-19 Recession = 2020.
Source: USDA, Economic Research Service.

Results - summary

- Food sales decreased in almost all states during recessions
- Great Recession:
  - Several States in the Central U.S. saw mixed smoothing factors for food sales
  - Transfers were the sole factor in smoothing food sales for most States
- COVID-19 Recession
  - Income and transfers were the factors in smoothing food sales
  - The impact of transfers in Alaska, Nevada, and Hawaii were the largest at (83, 59, and 50 percent, respectively)

Results - National

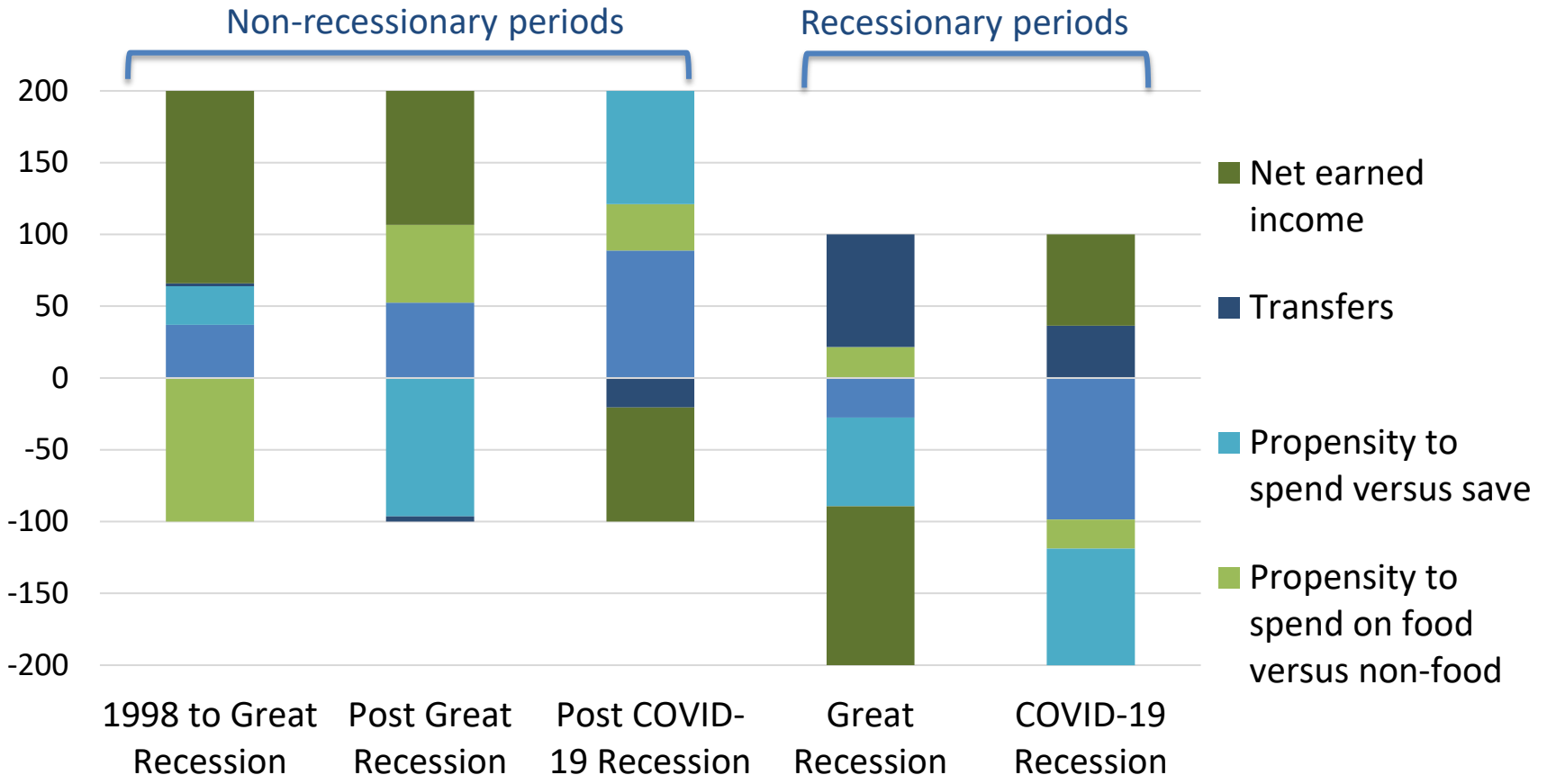
Contribution of each component to changes in aggregate food at home spending, by period



Note: Changes in total food spending are based on constant dollar sales (2023=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 = 1998 to 2007; Post-Great Recession = 2010 to 2019; Post-COVID-19 Recession = 2021 to 2023; Great Recession = 2008 to 2009; COVID-19 Recession = 2020.
Source: USDA, Economic Research Service.

Results - National

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



Note: Changes in total food spending are based on constant dollar sales (2023=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 = 1998 to 2007; Post-Great Recession = 2010 to 2019; Post-COVID-19 Recession = 2021 to 2023; Great Recession = 2008 to 2009; COVID-19 Recession = 2020.
Source: USDA, Economic Research Service.

Discussion

- We assess the responsiveness of food consumption to changes in income.
- Approximately 15 percent of income shocks are reflected in changes to food consumption, primarily driven by fluctuations in spending on food away from home during recessionary periods.
- Mobility restrictions, health concerns, and government transfers made 2020 spending unique.
- Understanding the dynamics of food spending at the State level sheds light on regional disparities and the different mechanisms in stabilizing food expenditures.
- Tailoring policy responses to local contexts based on these findings can enhance the resilience of households in times of economic uncertainty and contribute to improved food security outcomes.

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THANK YOU!

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Subcomponents of transfer receipts

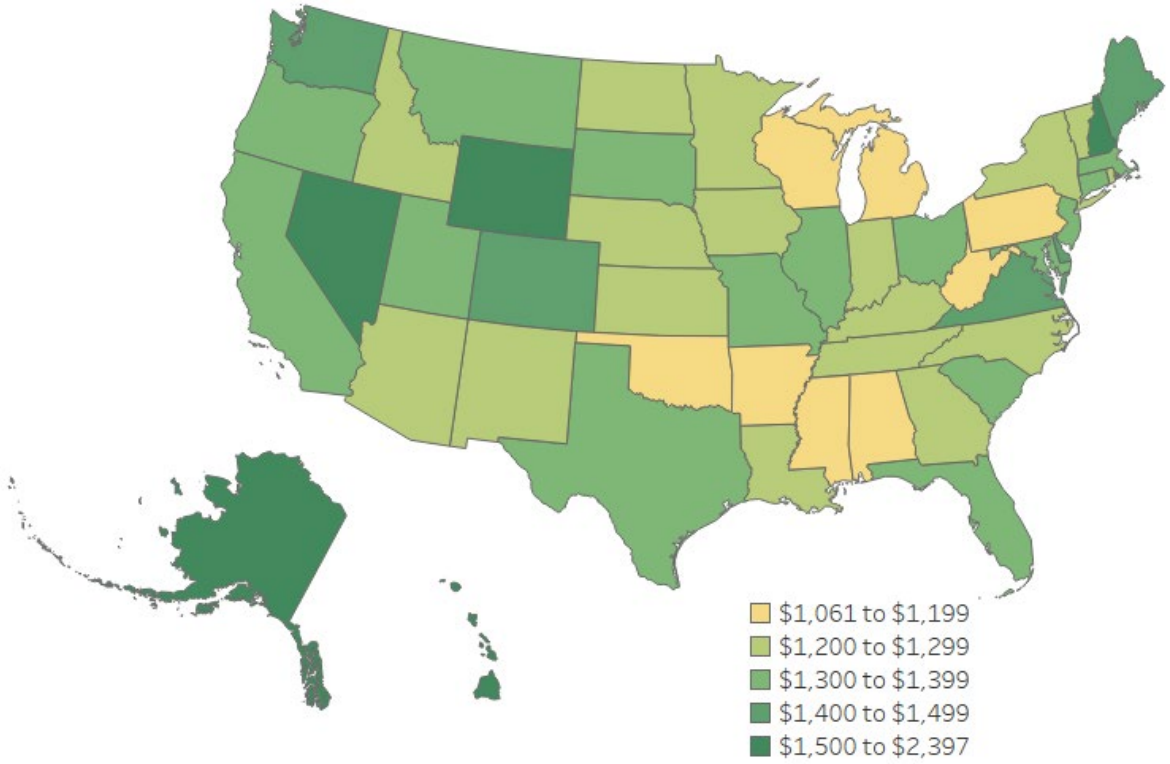
Transfer	Average percent of total transfers (1997 to 2022)	Funded by:	Administered by:
Social Security benefits	32.7%	Federal	Federal
Medicare benefits	22.4%	Federal	Federal
Medicaid	18.5%	Federal and State	State
Supplemental Security Income (SSI) benefits	2.3%	Federal and State	Federal
Earned Income Tax Credit (EITC)	2.5%	Federal	Federal
Supplemental Nutrition Assistance Program (SNAP)	2.2%	Federal	Federal
Other income maintenance benefits[3]	3.3%	Federal	Federal
State unemployment insurance compensation[4]	3.0%	State	State
Veterans' benefits[5]	2.9%	Federal	Federal
Education and training assistance[6]	2.2%	Federal	Federal
Other transfer receipts of individuals from governments[7]	4.8%	Federal, State, and local	Federal, State, and local
Current transfer receipts of nonprofit institutions	1.9%	Federal, State, and local	Nonprofit institutions
Current transfer receipts of individuals from businesses[8]	1.3%	Businesses	Federal, State, and local

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

Food sales during the Great Recession

United States Department of Agriculture

Average inflation-adjusted, per capita total food spending during the Great Recession, by State



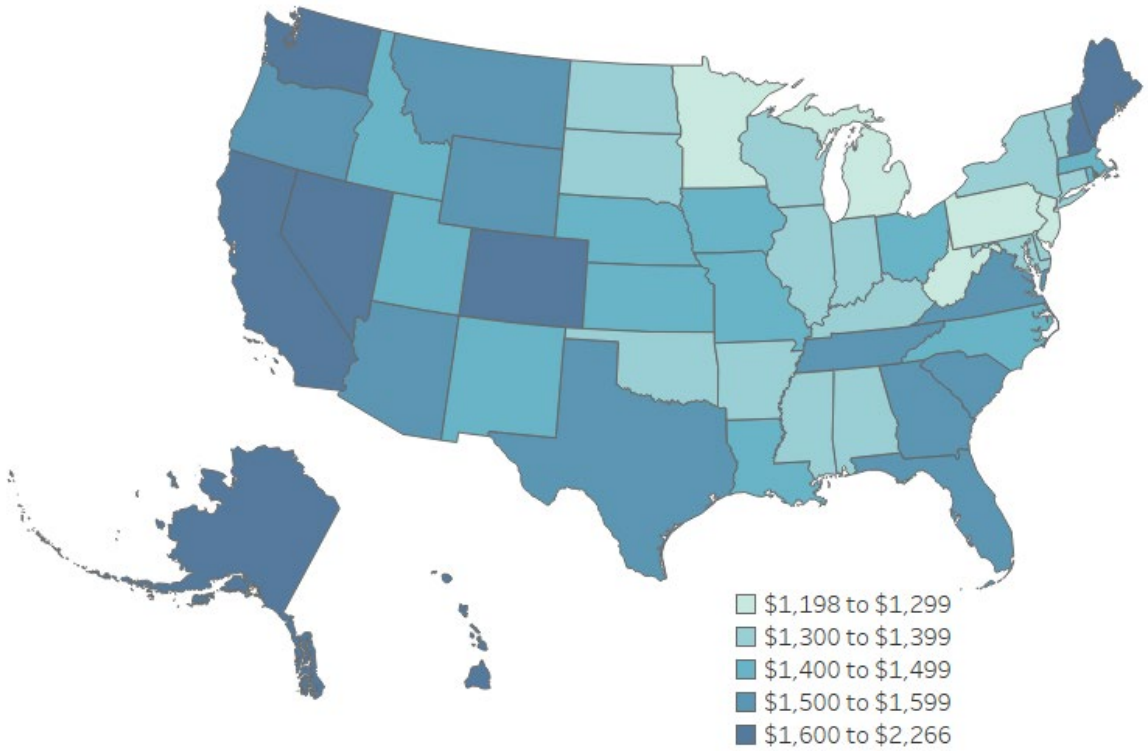
Note: Constant dollar sales (2022=100). Seasonally adjusted in per capita terms. Great Recession = Second quarter of 2007 to second quarter of 2009.

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

Food sales during the COVID-19 Recession

United States Department of Agriculture

Average inflation-adjusted, per capita total food spending during the COVID-19 Recession, by State



Note: Constant dollar sales (2022=100). Seasonally adjusted in per capita terms. COVID-19 Recession = first and second quarter of 2020.

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

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Investigating the channels for food expenditure smoothing

We extend Asdrubali, Sorensen, Yosha (1996)

$$Y_{i,t}^{inc} = \frac{Y_{i,t}^{inc}}{Y_{i,t}^{DPI}} \frac{Y_{i,t}^{DPI}}{PCE_{i,t}} \frac{PCE_{i,t}}{C_{i,t}^{food}} C_{i,t}^{food}$$

- $Y_{i,t}^{inc}$: i^{th} state's income, which includes net payments of dividend, interest, and rent across state borders minus taxes.
- $Y_{i,t}^{DIP}$: i^{th} state's disposable personal income, which accounts for transfers (including social security).
- $PCE_{i,t}$: i^{th} state's spending
- $C_{i,t}^{food}$: i^{th} state's consumption of food items

Decomposing the cross-sectional variance of shocks to income

$$\Delta \log(Y_{i,t}^{inc}) - \Delta \log(Y_{i,t}^{d}) = \alpha_{Tt} + \beta_t \Delta \log(Y_{i,t}^{inc}) + \epsilon_{it} \quad (1)$$

Risk shared through transfers

$$\Delta \log(Y_{i,t}^{d}) - \Delta \log(C_{i,t}^{total}) = \alpha_{st} + \beta_s \Delta \log(Y_{i,t}^{inc}) + \epsilon_{it} \quad (2)$$

Risk shared through savings

$$\Delta \log(C_{i,t}^{total}) - \Delta \log(C_{i,t}^{food}) = \alpha_{nt} + \beta_n \Delta \log(Y_{i,t}^{inc}) + \epsilon_{it} \quad (3)$$

Risk shared through non-food consumption

$$\Delta \log(C_{i,t}^{food}) = \alpha_{st} + \beta_u \Delta \log(Y_{i,t}^{inc}) + \epsilon_{it} \quad (4)$$

Unshared consumption risk