

Money matters: consumption variability across the income distribution

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Submitted: June 2022

Abstract

Using the Consumer Expenditure Survey, we document the level and variability of quarterly consumption across the socio-economic distribution. While the measurement of well-being is focused on income, the secular and policy discourse prioritises income-adequacy to meet family needs. This concern over income-adequacy centres on the capacity of families to predictably consume minimally acceptable levels of basic needs, and the social and economic mobility consequences of low consumption. Our results show a clear socio-economic and demographic gradient of lower consumption amid higher consumption variability for disadvantaged groups. Food, entertainment, and personal care goods and services exhibit relatively high levels of consumption variability among low-income households.

KEYWORDS

consumption variability, income distribution, inequality

JEL CLASSIFICATION

D12, D31, E2

1 | INTRODUCTION

The measurement of economic security in the United States has historically focused on income, while the secular and policy discourse prioritises income-adequacy to meet family needs. Concerns over income-adequacy centre on the capacity of families to predictably consume minimally acceptable levels of basic needs – food, clothing, shelter, utilities, and other essential goods – and the social and economic mobility consequences of low consumption.¹ In spite of the fact that both income and consumption help in characterising the economic situation of families,² there is relatively little recent evidence on the level and variability of consumption across income and socio-economic status.

¹ See, for example, Duncan et al. (2011), Hoynes, Schanzenbach and Almond (2016), Morduch and Schneider (2017) and Hardy, Hill and Romich (2019).

² See Johnson (2004) and Ziliak (2006, 2015).

Consumption-based measures of well-being may be better aligned with economic models and forecasts, given that well-being within canonical models of economic behaviour depends upon consumption, not income. Nonetheless, income maintains its status as the primary measure of well-being due to its widespread availability in surveys and administrative data; researchers very often admit income measures as an implied proxy for consumption. In recent years, the Census Bureau addressed these concerns by basing its threshold for a Supplemental Poverty Measure on contemporaneous food, clothing, shelter, and utilities expenditures.³

Alternative approaches to measuring poverty and economic well-being rely directly upon consumption data,⁴ and several consumption-based definitions of family resources produce lower poverty than income-based measures, suggesting that annual consumption among many low-income families exceeds their annual income. Federal statistical agencies in the United States continue to evaluate the production of a consumption-based poverty measure.⁵ A longer line of consumption inequality research finds that consumption inequality is lower than income inequality, but with mixed findings on whether consumption inequality increases with income inequality⁶ or fails to keep up with the growth in income inequality.⁷ A more recent literature has attempted to understand whether consumption variability increases along with income and earnings variability.⁸

To broaden our understanding of how consumption and income intersect, we examine both the level and variability of consumption across the income and socio-economic distribution, and across several categories of consumption central to the daily lives of families, including food and personal care.⁹ We adopt a measure of variability introduced by Gottschalk and Moffitt (1994). We do not capture home production, thus understating food consumption for households that invest significant time in food preparation.¹⁰ We follow the consumption variability literature in using the term ‘consumption’ to describe non-durable spending and outlays.

We use the Consumer Expenditures Survey (CE) from 1984 to 2019, incorporating the imputed income data for the CE developed in Fisher, Johnson and Smeeding (2015). This series imputes the components of income reported as received but where a dollar value was not provided. Unlike other surveys, the CE left this income value as missing before 2004. The imputation of Fisher et al. (2015) creates a consistent measure of household income, allowing for respondents to be more accurately placed within income deciles.

Consistent with a series of related, earlier studies,¹¹ we find a clear socio-economic and demographic gradient: higher income shares and higher consumption variability occur among families with lower income and families with less education, as well as for Black families. This is the case for all consumption categories except gasoline spending and alcohol spending, and our findings are generally robust to the variability measure. Among the categories we track, food, entertainment and personal care exhibit especially high levels of consumption variability for low-income households.

Using this richer information on income, we contribute to a literature examining the level, share and variability of consumption in research using the short-panel, within-year feature of the CE design. Up to this point, the CE has generally lacked consistent information on the income characteristics of sample respondents, while the design of longer-panel data sets with rich information on income,

³ Citro and Michael, 1995; Fox, 2019.

⁴ See Fisher et al. (2009), Meyer and Sullivan (2012, 2017) and Fitzgerald and Moffitt (2022).

⁵ Interagency Technical Working Group, 2021.

⁶ See Cutler and Katz (1991), Heathcote, Perri and Violante (2010) and Fisher, Johnson and Smeeding (2015).

⁷ See Krueger and Perri (2006), Blundell, Pistaferri and Preston (2008) and Meyer and Sullivan (2013).

⁸ See Davis and Kahn (2008), Gorbachev (2011) and Dogra and Gorbachev (2015).

⁹ Data limitations prevent us from measuring variability for the other components of consumption that define the Supplemental Poverty Measure: shelter and utilities. Section 3.1 provides a detailed discussion.

¹⁰ Aguiar and Hurst, 2005.

¹¹ For example, Blundell and Pistaferri (2003) and Kniesner and Ziliak (2002a).

such as the Panel Study of Income Dynamics (PSID), does not facilitate within-year variability measurement.

We also add to the literature by introducing a broader categorical range, including but not limited to food expenditures; this addition augments PSID-based studies that have focused on food.¹² We look at necessities as well as luxuries. Variability of a necessity such as food is expected to be lower than other consumption categories, and variability of food may be different across the income distribution and socio-demographic characteristics.

Ultimately, our within-year examination of consumption fluctuations reveals stark gaps in consumption variability among lower-income families and families with less-educated heads, as well as Black families. Peaks and valleys in consumption for categories such as food, especially for families with limited liquidity, have negative implications for well-being. This is especially true given the current design of tax and transfer programmes in the US, which have increasingly eschewed cash for in-kind benefits; the largest cash transfer to poor Americans occurs via refundable tax credits, received once via lump-sum in February–April. If made permanent, the 2021 monthly child allowance provisions could provide helpful liquidity to smooth consumption of necessities on a periodic basis, such as food, that have been linked to improved socio-economic outcomes. While the once-per-year earned income tax credit (EITC) provides important assistance, in any given year many low-income families experience income fluctuations, irregular scheduling and job changes that interrupt stable consumption.¹³

2 | RECENT EVIDENCE ON CONSUMPTION VARIABILITY AND SOCIO-ECONOMIC WELL-BEING

The variability of consumption has long been of particular interest; if deprivation via low income translates to less predictable or unstable consumption of food, housing and other necessities, this could have serious implications for well-being. A substantial literature on economic variability has focused on both income¹⁴ and consumption¹⁵ separately, though fewer studies examine the evolution of consumption variability across the income distribution.¹⁶ Consumption variability is higher among low socio-economic groups – as proxied by education – and the transfer system ostensibly insures against consumption shocks. Still, we know less about the subcomponents of this consumption variability – which aspects of the household’s consumption bundle are more or less unpredictable across the income distribution – and how this looks over a time horizon that captures the contemporary US economy. This gap in knowledge stands in contrast to core justifications for income transfer and social insurance programmes, namely that the limited ability of low-income individuals and families to smooth consumption requires public policy interventions. Models of risk aversion predict that individual agents and, by consequence, households would lower their own consumption amid volatile streams of income.¹⁷ Thus, given evidence that income variability is higher among relatively lower-income households, it is plausible that the previously documented higher levels of consumption variability resulted in lowered utility.

Our study builds upon previous research, which captures annual income and consumption variability. While this feature is due largely to data availability, consumption varies within a month.

¹² See Gundersen and Ziliak (2003), Gorbachev (2011) and Dogra and Gorbachev (2015).

¹³ See Schneider and Harknett (2017, 2019) and Ziliak, Hardy and Bollinger (2011).

¹⁴ See, for example, Gottschalk and Moffitt (1994, 2009), Dahl, DeLeire and Schwabish (2011), Ziliak et al. (2011) and Carr and Wiemers (2018).

¹⁵ See, for example, Kniesner and Ziliak (2002a, b), Blundell and Pistaferri (2003), Blundell et al. (2008), Davis and Kahn (2008), Gorbachev (2011) and Baker (2018).

¹⁶ See, for example, Kniesner and Ziliak (2002a), Blundell and Pistaferri (2003) and Gorbachev (2011).

¹⁷ Attanasio and Weber, 2010.

Spending on food and, more importantly, consumption of food is sensitive to income receipt.¹⁸ For example, Hastings and Washington (2010) find that spending on food falls 20 per cent between the week of Supplemental Nutrition Assistance Program (SNAP) receipt and the following week. When viewed from an annual perspective, spending may not appear volatile. However, weekly, monthly or quarterly frequencies will likely reveal more variability, and this increased variability implies real utility loss.¹⁹ By measuring variability at a quarterly frequency, we capture variability missed in annual measures. That said, we still miss weekly or monthly variability that is smoothed out over three months, but some of this weekly or monthly variability may be due to the difference between spending and consumption. Some food spending could be for non-perishable items consumed in the future. Our quarterly variability analysis captures variability induced by income shocks such as job loss, as well as any lags in the receipt of unemployment or other transfer programme benefits. It also reflects seasonal changes in income or within-year income variability.

In our study, we examine the level and variability of consumption for the following categories: food, food away from home, food at home, entertainment, gasoline plus public transportation, alcohol, and strictly non-durable spending. Food is commonly considered to be one of the three basic necessities within a family budget – the others being shelter and clothing.²⁰ We do not include shelter, as the CE is an address-based sample. Most shelter-related consumption variability derives from a move, and because the CE does not survey families in their move to a new residence, there is relatively little shelter variability. We exclude apparel because it contains durable components that may exhibit spending variability but less consumption variability. We also exclude utilities, as we may fail to capture utilities for those whose rent includes some or all utilities or those whose homeowner's association fees include some or all utilities.

The distinction between housing and food in the CE is worth exploring further. Housing in the CE represents the consumption value, regardless of whether the rent was paid or the mortgage was paid. It represents the consumption of shelter regardless of the out-of-pocket expenditure that quarter. Food, entertainment, personal care, gasoline and alcohol represent expenditures that quarter. Families can supplement expenditures with home production, particularly for food. Recent retirees and recently unemployed decrease food expenditures but increase their home production of food, with retirees experiencing no change in food consumption when accounting for home production.²¹ Our results may overstate food variability because of unobserved home production, particularly if the movement to home production differs by income decile. Our sample is limited to those aged between 25 and 60, thus negating the worry about the retirement transition.

The focus on these categories does not preclude an analysis into categories outside of basic needs. Seminal work on poverty measurement led by the National Academies of Sciences argued for an updated threshold that would not only focus on these three broad basic necessity categories, but would also provide some additional allowance for other needed expenses.²² This additional allowance accounts for expenditures on personal care, household supplies and non-work-related transportation. Accordingly, we have included personal care, entertainment, gasoline and alcohol.²³

The level and variability of consumption reflects the constrained choices of family heads, especially so for resource-poor families. And, while the literature on consumption variability has rightly focused initially on food – given its importance for health and basic sustenance – low-income households alter consumption on more than just food in response to economic deprivation as well as to social safety net programmes operating as consumption insurance. Households may reduce food consumption as

¹⁸ See Stephens (2003), Shapiro (2005) and Hastings and Washington (2010).

¹⁹ Blundell et al., 2008.

²⁰ Citro and Michael, 1995.

²¹ Aguiar and Hurst, 2005.

²² Citro and Michael, 1995; Ziliak, Mackie and Citro, 2023.

²³ Our measure of gasoline plus public transportation cannot separate out work-related travel.

financial resources run low towards the end of the month, leading to increased hypoglycaemia-related hospital admissions.²⁴ Food assistance programmes such as the SNAP are well positioned to provide consumption insurance²⁵ and, increasingly, the EITC provides similar insurance against shocks to income and consumption. Having largely substituted for cash welfare,²⁶ evidence shows that the EITC increases spending on food,²⁷ transportation²⁸ and clothing.²⁹ Consumption also responds to other predictable income shocks, such as tax refunds,³⁰ retirement,³¹ layoffs³² and paying off debt,³³ among others.

We anticipate different levels of variability between necessities (i.e. food) versus luxuries (e.g. entertainment), and we want to understand whether differing consumption levels translate to differences in variability across income and demographic characteristics. In the context of considering consumption levels as a benchmark for assessing poverty and economic well-being, it is important to consider shifts and swings in consumption, which could shape our appraisal of the daily lives of low- and moderate-income families.

3 | DATA AND MODEL

3.1 | Data

The data used in our study come from the 1984–2019 CE, providing quarterly accounts of household-level expenditures. The data also include information on household income and socio-demographic characteristics. While the CE contains a full suite of data on durables and non-durables alike, we focus on the following expenditure categories: overall food consumption, food at home, food away from home, personal care, entertainment, gasoline plus public transportation, alcohol, and strictly non-durable spending. Strictly non-durable is a commonly used measure in the consumption literature.³⁴ It includes spending on food, utilities, household operations, personal care, gasoline, public transportation, alcohol, and tobacco.

The frequency of the data is quarterly, which is an important contribution in order to better understand household consumption variability within the year. Each household is surveyed for four consecutive quarters so that, for example, a household initially interviewed in April would be asked about their prior spending in January, February and March. Income is not asked about on a quarterly basis, and instead is asked about at the last interview and represents the retrospective 12 months. The income reported covers the same 12 months captured by the expenditure questions. The sample design consists of a rolling, within-year panel, in which people are interviewed each month of the year. Ultimately, the final data are a repeated cross-section of within-calendar-year observations.

Within the consumption category of food, we further divide this into food at home and food away from home. Personal care includes items such as haircuts and other personal care services, electronic personal care appliances and wigs. Entertainment includes fees such as golf, bowling and gym memberships along with movie, sport and concert tickets. It also includes spending on durables

²⁴ Seligman et al., 2014.

²⁵ For example, Hoynes and Schanzenbach (2009).

²⁶ Hardy, Smeeding and Ziliak, 2018a.

²⁷ McGranahan and Schanzenbach, 2013.

²⁸ Barrow and McGranahan, 2000; Smeeding, Phillips and O'Connor, 2000.

²⁹ Romich and Weisner, 2000.

³⁰ Johnson, Parker and Souleles, 2006.

³¹ Bernheim, Skinner and Weinberg, 2001.

³² Ganong et al., 2020.

³³ Coulibaly and Li, 2006.

³⁴ Lusardi, 1996; Parker et al., 2013.

such as televisions, the purchase of music and movies, and the purchase of sports equipment, hunting equipment and camping equipment.

Bee, Meyer and Sullivan (2015) compare aggregate spending in the CE to aggregate spending in the Personal Consumption Expenditures Survey (PCE), finding that CE food at home and gasoline aggregates match PCE aggregates. Food away from home, alcohol and entertainment aggregates fall over time relative to the PCE.³⁵ This potential under-reporting matches broad patterns seen in US surveys and applies equally to earnings and income.³⁶ The potentially declining quality in consumption reporting is less problematic for our purposes, as long as a given household reports equally well across its four interviews.

We improve upon previous work by incorporating an imputed income series from Fisher et al. (2015). Prior to 2004, the CE did not impute income for those who reported having a source of income but failed to report the dollar value. Fisher et al. (2015) use the same imputation methodology the CE has utilised since 2004 to impute income back to 1984, allowing for a consistent income measure over our entire sample. With imputed income, the CE income distribution matches the Current Population Survey (CPS) income distribution well. In addition, Fisher et al. (2015) provide an after-tax income measure, which is important when using data from a time period with large changes in the tax structure. Since the second quarter of 2013, the CE has provided imputed after-tax income, with taxes estimated from TAXSIM. Davis and Kahn (2008) also measure quarterly consumption variability in the CE by income decile from 1984–2004, but they do not use imputed income and they use before-tax income.

Income reported in surveys contains measurement error. Respondents under-report transfer income on the intensive and extensive margins.³⁷ Meanwhile, wage and salary earnings in the CE are over-reported at the bottom of the income distribution and under-reported at the top.^{38,39} We place households in after-tax income deciles, and measurement error could place some households in the incorrect decile. The use of deciles should decrease the impact of the measurement error as we would expect it to be smaller in deciles than in the continuous measure. Measurement error driven by income will also generate measurement error in the share of income by spending category, presented below. All findings detailed below hold when we use non-durable spending⁴⁰ or education in place of after-tax income. All results are in real 2013 dollars using the CPI-U-RS.⁴¹ To account for differences in family size and changes in family size across quarters, spending is adjusted using the square root of family size as the equivalence scale.

3.2 | Model

Within our repeated cross-sectional data, we draw upon the conceptual framework of Gottschalk and Moffitt (1994) by estimating the predictors of consumption variability, V_{it} , for a given category of consumption over four quarters Q within year t , defined as

$$V_{it} = \left(\frac{1}{Q_i - 1} \right) \sum_{q=1}^{Q_i} \left(\ln c_{iqt} - \overline{\ln c_{it}} \right)^2. \quad (1)$$

³⁵ Li et al. (2010) compare PSID consumption categories to CE categories and find that the PSID and CE match, indicating that the CE and PSID consumption are of similar quality.

³⁶ Bollinger et al., 2019.

³⁷ Meyer and Mittag, 2019.

³⁸ Brummet et al., 2018.

³⁹ In a UK survey, median expenditures are u-shaped over the income distribution (Brewer, Etheridge, and O’Dea 2017). As shown in Figure 1, the CE Survey does not appear to suffer from as much underreporting of income as in the Living Costs and Food Survey in the UK.

⁴⁰ Heathcote et al., 2010.

⁴¹ Consumer Price Index Research Series Using Current Methods, 1984–2019.

Consumption, $\ln c_{iqt}$, is residualised to purge out life-cycle effects, via a quartic for age.⁴² V_{it} represents consumption variability across households, i , as measured between quarters q .⁴³ We restrict the sample to households that respond to all four quarterly surveys, such that Q_i , the number of quarterly observations, equals four for all households. This variability measure represents short-term shocks to consumption and not the more structural measure of transitory volatility from Blundell et al. (2008) or Gorbachev (2011). Consistent with Gorbachev (2011) and Alan et al. (2009), we assume that measurement error is invariant within a household across quarters, constant across the income distribution, and unrelated to our independent variables of interest.

V_{it} serves as the dependent variable in a series of repeated cross-sectional regression models for each category of consumption, estimated as

$$V_{it} = \alpha + \beta_d \sum_{d=1}^{d=10} I_{idt} + \mathbf{X}_{it}\delta + \rho_t + \varepsilon_{it}. \quad (2)$$

Our construction of an income distribution consists of income deciles backcasted. These within-year deciles are characterised additively, as $\beta_d \sum_{d=1}^{d=10} I_{idt}$. Respondents, within their sample year, are pooled according to their membership in one of ten income deciles. We use after-tax income plus cash transfers and SNAP benefits as our income measure. We control for a vector of socio-economic characteristics \mathbf{X}_{it} , such as race, education, marital status and family structure; family structure controls include the number of dependent children as well as adults.⁴⁴ Finally, we also control for year fixed effects ρ_t . Importantly, ours is a descriptive exercise that does not estimate structural parameters. Thus, the resulting descriptive models are organised as a series of economic and demographic predictors of consumption variability. In unreported results, we test the robustness of our consumption variability measures to summary measures of variability, including the total variance as well as percentage changes.

4 | CONSUMPTION LEVELS ACROSS THE INCOME DISTRIBUTION

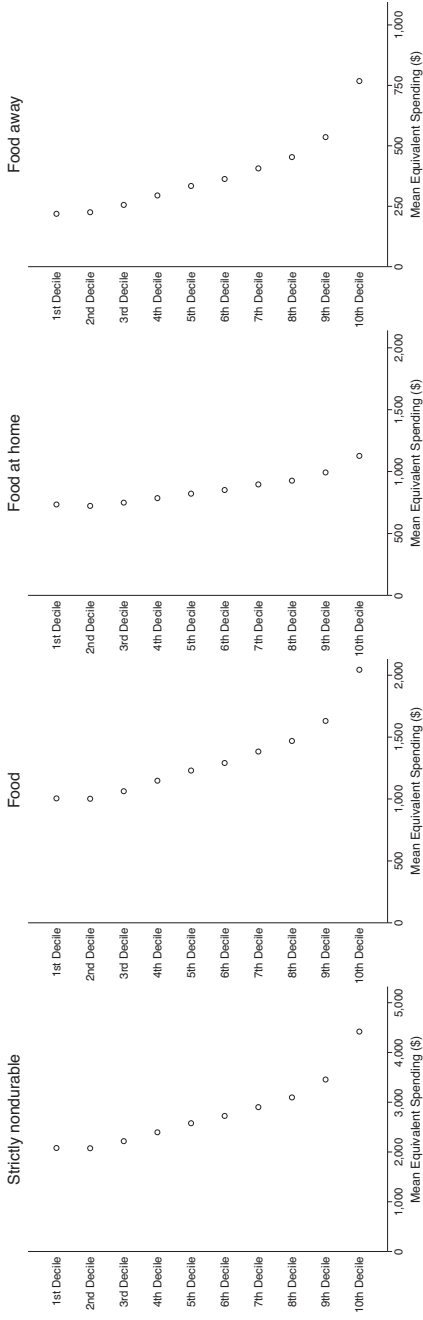
Concerns over the downside consequences of consumption variability are warranted insofar as low- and moderate-income families may simultaneously consume lower levels of goods and services, some of which are considered basic needs (i.e. food), as well as fairly standard expenditures on entertainment and alcohol. In Figure 1, we assess differences in average equivalent expenditures across income deciles, pooled over the full sample. Income deciles are created within a year. Here, we find clear income gradients across all categories. Interestingly, the largest income gaps in family-size adjusted expenditures occur for food and entertainment. Disaggregating food, the income gap in food expenditure, which is 100 per cent higher for the 10th versus 1st decile, is driven by expenditures on food away from home (food away). Respondents in the 1st decile spend \$220 per quarter on food away, whereas respondents in the 8th decile spend two times more, and those in the 10th decile spend three and a half times more. In percentage terms, there are large gaps in expenditures on personal care, though even the most affluent families spend, on average, \$350 on personal care. Gasoline and alcohol spending follow a clear income gradient as well, with higher-income families spending

⁴² We add one to c_{iqt} before taking the natural log, which allows for zero values to enter our consumption definition.

⁴³ Under more restrictive assumptions, Solon and Shin (2011) demonstrate that a standard variance components model decomposes earnings dynamics into orthogonal permanent and transitory components, yielding V_{it} as a measure of transitory volatility.

⁴⁴ We capture predictable life-cycle changes in consumption in the creation of variability following Blundell et al. (2008) and Gorbachev (2011).

Panel A



Panel B

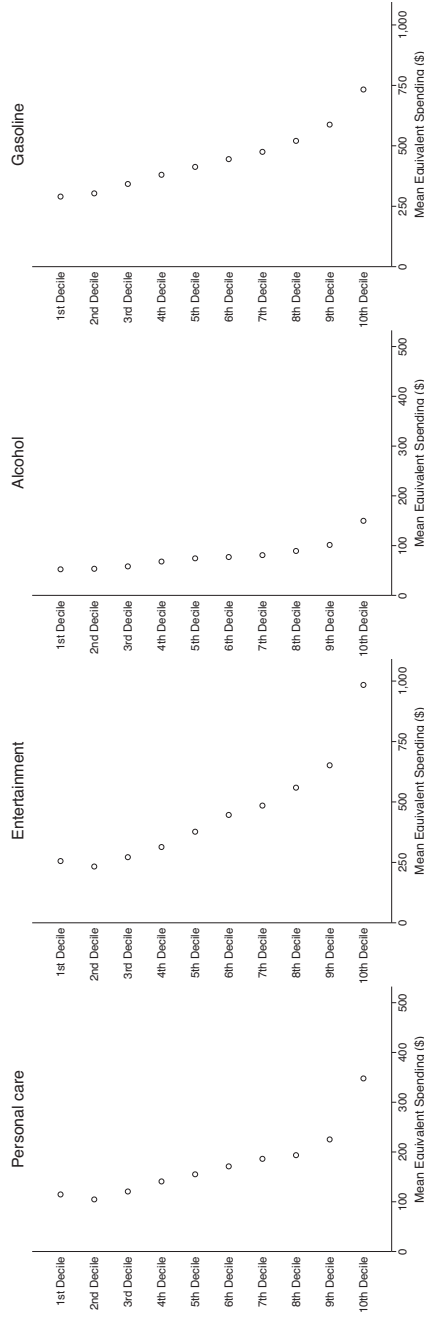


FIGURE 1 Mean equivalent quarterly spending by consumption category and after-tax income decile.

Note: We use the square root of family size as the equivalence scale. $N = 362,144$.

Source: Authors' calculations based on the 1984–2019 CE.

more.⁴⁵ Finally, the aggregate category, strictly non-durable, shows a strong gradient, with the top decile spending more than double the bottom decile.

Figure 2, which depicts consumption as a share of income, offers clearer descriptive evidence that low- and moderate-income families spend a meaningful proportion of their resources on some basic needs; variability of consumption is occurring on a low base of income and consumption, and consumption takes up a sizeable portion of the budget. To better represent similar concepts of quarterly spending and quarterly income, the denominator represents annual income divided by four. Strikingly, food consumption comprises 146 per cent of family quarterly income for the bottom decile, and roughly 25 per cent for the 2nd and 3rd income deciles. Consumption subsumes a disproportionate share of family incomes at the bottom of the distribution with the exception of personal care and alcohol; for these two categories, the differences are qualitatively small across income deciles. Taking the results from Figures 1 and 2 together, very low-income families at the 1st decile spend a relatively large share of income on basic needs and other routine consumption goods, including personal care, gasoline and entertainment.⁴⁶

In Figure 3, we depict consumption variability by category and position in the after-tax income distribution. These descriptive statistics show the trend in median consumption variability (black bar), the 25th and 75th percentiles of consumption variability (end points of the grey bar), and the upper and lower adjacent values (whiskers).⁴⁷ A general result is that median consumption variability patterns are roughly similar across our categories except for gasoline and alcohol. The dispersion in these consumption variability patterns is apparent, particularly at the 75th percentiles and the upper adjacent values. Lower-income respondents consistently have a wider range of variability values across the consumption categories and, comparatively, this is observable for food at home, gasoline and entertainment variability patterns. There are also noteworthy differences in the level of consumption variability across categories. As the largest and broadest category, strictly non-durable spending not surprisingly exhibits the lowest variability across all income deciles. Food away, personal care and entertainment consumption variability are all higher – at the median – than food consumption variability and one of its subcomponents, food at home. In some respects, this is consistent with how families would prioritise basic needs: there are more likely discretionary choices made in the decision to purchase the marginal personal care or entertainment categorical item. Consumption variability potentially reflects the instability of consumption that is dependent upon current-period economic circumstances. While food consumption variability among the poor is more volatile, families likely sacrifice consumption in other domains to fulfil one of the main basic needs.

Gasoline and alcohol flip this narrative. Gasoline variability is higher in the tails of the income distribution, matching Hardy and Ziliak (2014) who find faster increases in income variability at the bottom and top of the income distribution. Alcohol variability at the median and 75th percentile increases with income decile. Those with higher income exhibit greater variability in their alcohol consumption, though these differences are from a low spending base.

Our results diverge somewhat from similar work by Davis and Kahn (2008), who find higher non-durable consumption variability at the top of the predicted consumption distribution, using predicted consumption as a proxy for permanent income. Although they also measure consumption variability in the CE, they address a different issue – how consumption variability differs across the permanent income distribution and over time. We want to understand consumption variability across the contemporaneous after-tax income distribution, which could help explain differences in results.⁴⁸

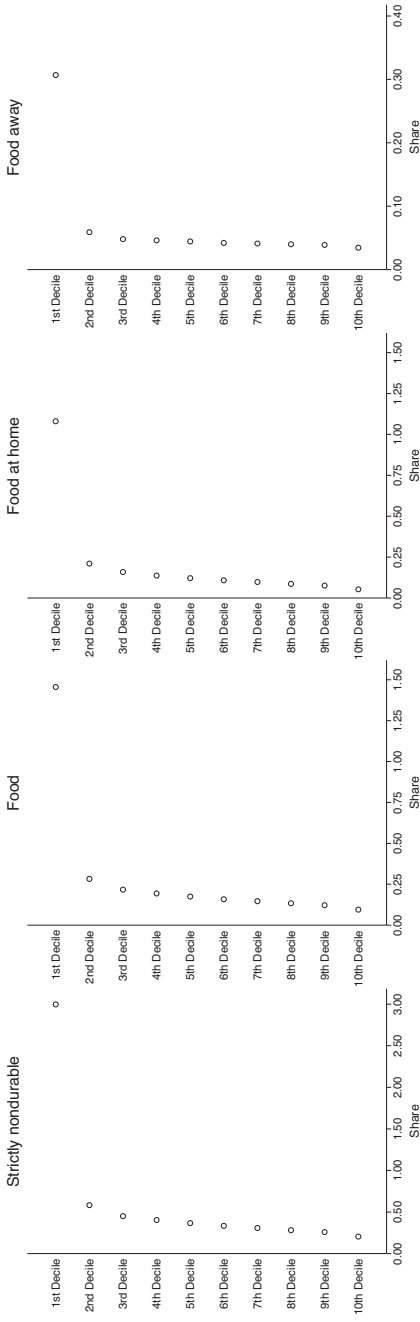
⁴⁵ Bee et al. (2015) find that the CE captures only one-quarter of alcohol spending compared to aggregates from the PCE. This under-reporting of alcohol explains why alcohol spending appears low in Figure 1.

⁴⁶ Mean equivalent after-tax income in the bottom decile equals \$5,850.

⁴⁷ The upper (lower) adjacent value is the largest (smallest) observation that is less than or equal to the upper (lower) inner fence, which is defined as the third quartile plus 1.5 * (inner quartile range).

⁴⁸ Our results hold when using non-durable spending following Heathcote et al. (2010), which we presume is the same definition used by Davis and Kahn (2008).

Panel A



Panel B

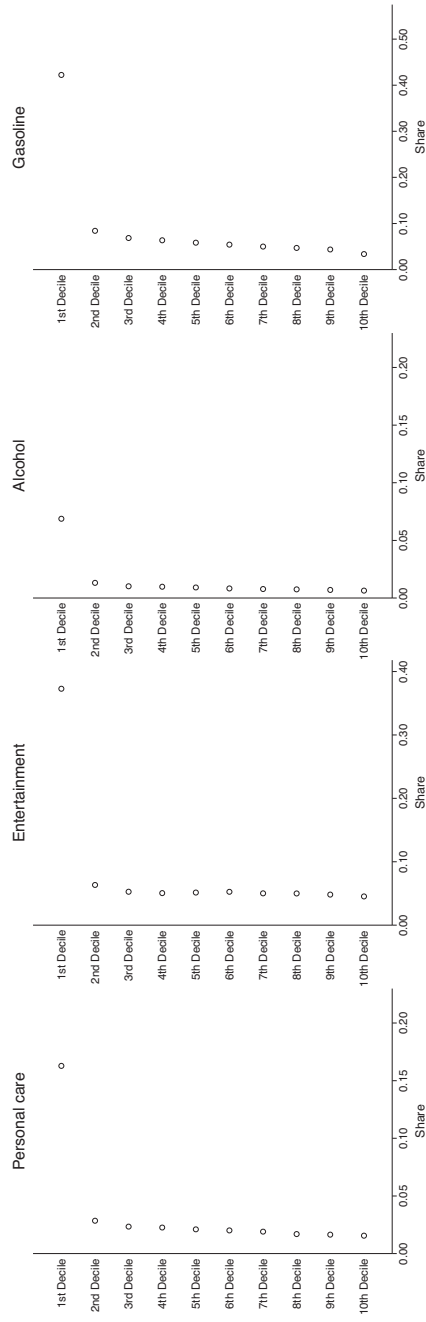
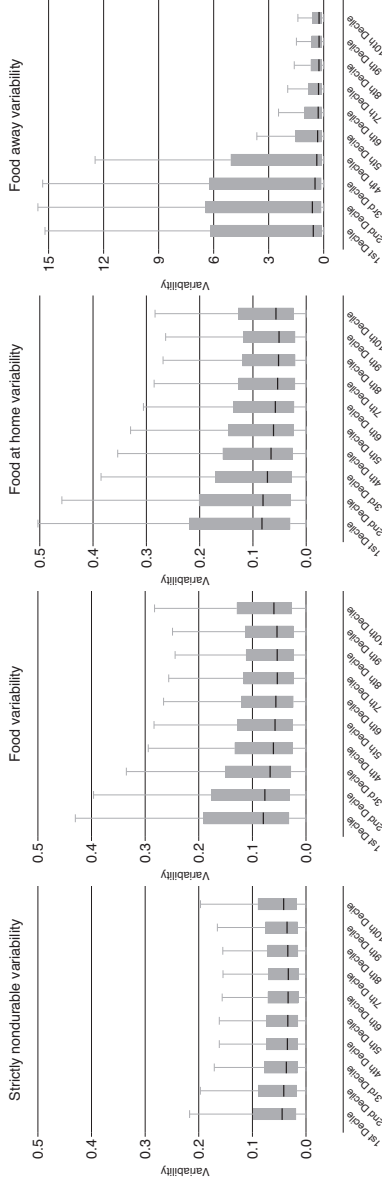


FIGURE 2 Spending as share of income by consumption category and after-tax income decile.
 Note: $N = 362,144$. We divide 12-month income by four to approximate quarterly income to match our quarterly spending data.
 Source: Authors' calculations based on the 1984–2019 CE.

Panel A



Panel B

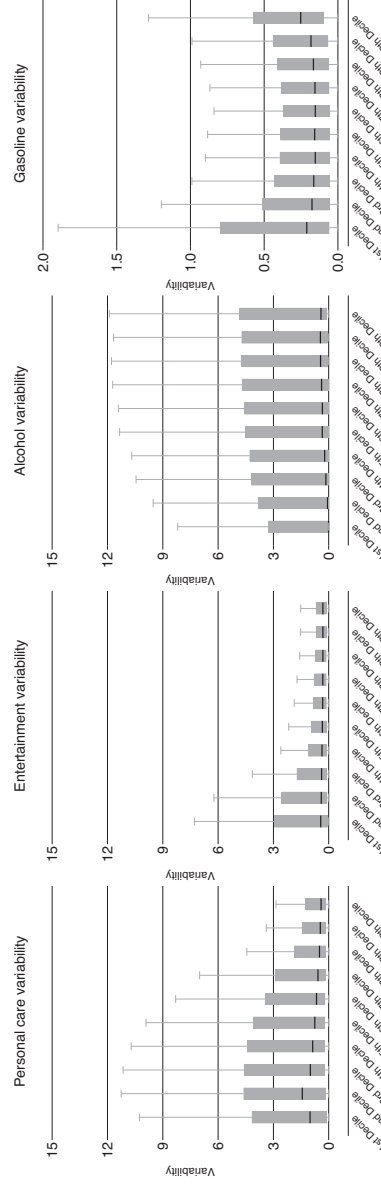


FIGURE 3 Box plots of transitory consumption variability by consumption category and after-tax income decile.

Note: $N = 90,536$. We use one observation per household when measuring transitory variability. The figure shows the trend in median consumption variability (black bar), the 25th and 75th percentiles of consumption variability (end points of the grey bar), and the upper and lower adjacent values (whiskers). The upper (lower) adjacent value is the largest (smallest) observation that is less than or equal to the upper (lower) inner fence, which is defined as the third quartile plus $1.5 \times$ (inner quartile range).

Source: Authors' calculations based on the 1984–2019 CE.

5 | CONSUMPTION VARIABILITY ACROSS THE INCOME DISTRIBUTION

5.1 | Strictly non-durable variability

Moving to Figure 4, we begin our discussion of the main results. Here, we provide a graphical exposition of the ordinary least-squares (OLS) results, and separately discuss demographic patterns, which are controlled for here. Coefficients and standard errors for the income decile variables are also provided in Table 1. We begin our inquiry into consumption variability across the income distribution by focusing on our broadest category, strictly non-durable spending. Specifically, relative to the top income decile with a mean strictly non-durable variability of 0.075, variability ranges from 0.026 higher (bottom decile) to 0.020 lower (fourth decile). The bottom decile is the only decile with higher variability than the top decile.

5.2 | Food variability

Given concerns surrounding food security among the poor and near-poor, we turn to food. Relative to the top income decile with a mean food variability of 0.113, consumption variability ranges from 0.192 higher (bottom decile) to 0.032 lower (4th decile). The two bottom income deciles experience higher consumption variability than the 3rd to 10th deciles, indicating that there is potentially worrisome food variability, not solely for the poorest of the poor, but also among the bottom 20 per cent of the population. Interestingly, food variability is higher at the 10th decile than at the 3rd to 9th deciles, but not all differences are statistically significant at usual levels. This food variability at the top is centred around mean spending of approximately \$3,640 per quarter. There is no concern here about food insecurity or food sufficiency in the top income decile. Instead, it may reflect that at the top of the income distribution, food spending can become a luxury and represent more than just food as sustenance. Within the income distribution, there is a relative flattening out of consumption variability between the 4th and 8th income deciles, before rising slightly in the 9th and 10th deciles. Here, as before, it is worthwhile considering the level of consumption; the median level of food consumption at the 9th and 10th deciles is \$2,630 and \$3,200 per quarter, respectively. This compares to a range of \$1,170–\$1,410 across the bottom three income deciles.

One might be concerned that outliers drive the OLS results on variability across the income distribution.⁴⁹ Figure 3 shows smaller differences in median variability but significantly larger differences at the 75th percentile and higher. Table A1 in the online appendix shows that the income results hold using median regressions. While the patterns are not as stark using the median, the variability-income decile gradient remains the same using the median for food and for the other consumption categories.

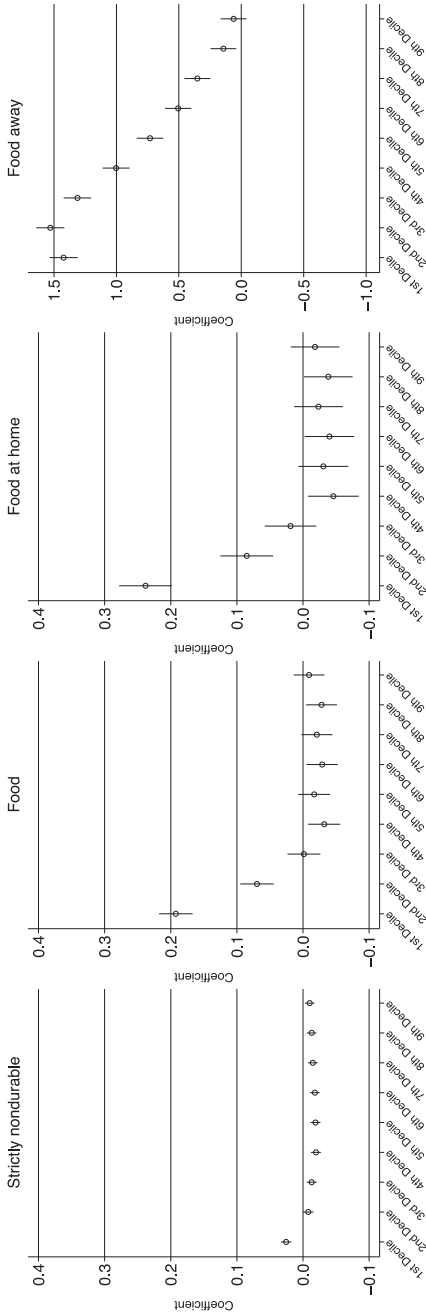
5.3 | Food at home variability

Although food consumption at home may no longer occur as a realistic, daily option for many working-poor or near-poor families,⁵⁰ home-based consumption has traditionally been viewed as more cost-effective. Thus, it is interesting that the overall income gradient in food variability persists for home consumption. Specifically, food at home variability (Figure 4, Panel A) ranges from 0.238 higher (bottom decile) to 0.046 lower (4th decile) than the top decile. Interestingly, the middle 70 per

⁴⁹ Jensen and Shore, 2015.

⁵⁰ Ziliak, 2016.

Panel A



Panel B

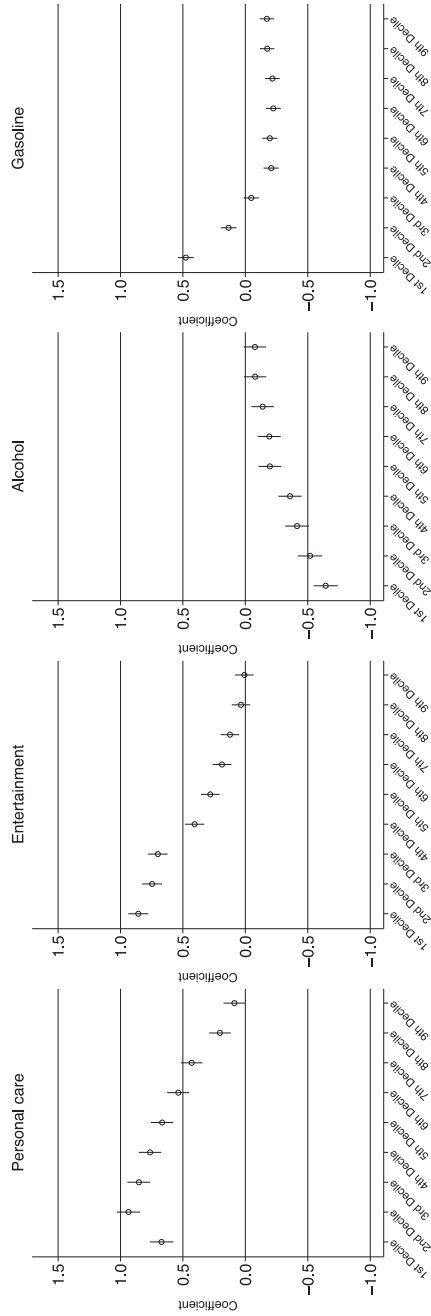


FIGURE 4 Regression-based consumption variability relative to the 10th decile of after-tax income, by consumption category.
 Note: The top decile is the omitted category. The lines represent the 95 per cent confidence interval. $N = 90,536$. Coefficients and standard errors available in Table 1.
 Source: Authors' calculations based on the 1984–2019 CE.

TABLE 1 OLS regression results on income deciles

	Strictly non-durable (1)	Food (2)	Food at home (3)	Food away (4)	Entertainment (5)	Personal care (6)	Gasoline (7)	Alcohol (8)
Bottom decile	0.0256*** (0.0040)	0.1924*** (0.0129)	0.2381*** (0.0204)	1.4226*** (0.0573)	0.8577*** (0.0407)	0.6712*** (0.0479)	0.4765*** (0.0322)	-0.6431*** (0.0494)
Second decile	-0.0079* (0.0040)	0.0696*** (0.0130)	0.0851*** (0.0204)	1.5292*** (0.0574)	0.7469*** (0.0408)	0.9358*** (0.0480)	0.1346*** (0.0323)	-0.5180*** (0.0495)
Third decile	-0.0132*** (0.0039)	-0.0014 (0.0126)	0.0189 (0.0199)	1.3120*** (0.0560)	0.7008*** (0.0398)	0.8530*** (0.0468)	-0.0469 (0.0315)	-0.4139*** (0.0483)
Fourth decile	-0.0195*** (0.0039)	-0.0321** (0.0124)	-0.0459* (0.0195)	1.0024*** (0.0550)	0.4063*** (0.0391)	0.7636*** (0.0459)	-0.2064** (0.0309)	-0.3571*** (0.0474)
Fifth decile	-0.0189*** (0.0038)	-0.0168 (0.0122)	-0.0307 (0.0193)	0.7308*** (0.0542)	0.2809*** (0.0385)	0.6668*** (0.0453)	-0.1956*** (0.0305)	-0.11957*** (0.0468)
Sixth decile	-0.0179*** (0.0038)	-0.0290* (0.0121)	-0.0399* (0.0190)	0.5061*** (0.0535)	0.1876*** (0.0380)	0.5376*** (0.0447)	-0.2235*** (0.0301)	-0.1909*** (0.0462)
Seventh decile	-0.0147*** (0.0037)	-0.0209 (0.0120)	-0.0234 (0.0189)	0.3518*** (0.0531)	0.1236** (0.0377)	0.4304*** (0.0444)	-0.2169*** (0.0298)	-0.1378** (0.0458)
Eighth decile	-0.0131*** (0.0037)	-0.0281* (0.0119)	-0.0381* (0.0188)	0.1437** (0.0528)	0.0351 (0.0375)	0.2042 (0.0441)	-0.1743*** (0.0297)	-0.0783 (0.0455)
Ninth decile	-0.0101** (0.0037)	-0.0091 (0.0119)	-0.0181 (0.0187)	0.0616 (0.0525)	0.0081 (0.0373)	0.0886* (0.0439)	-0.1724*** (0.0295)	-0.0758 (0.0453)
Adjusted R ²	0.007	0.016	0.018	0.066	0.058	0.036	0.035	0.010
N	90,536	90,536	90,536	90,536	90,536	90,536	90,536	90,536

Note: Dependent variable is variability. Standard errors in parentheses. Omitted category is the 10th decile. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Source: Authors' calculations based on the 1984–2019 CE.

cent of the income distribution are mostly indistinguishable from the variability experienced by the top decile. When considered within the context of low levels of food at home expenditures – families in the first decile spend 20 per cent of their income within this category, on average – relatively higher levels of consumption expenditure variability may warrant continued attention from policymakers.

5.4 | Food away from home variability

Predictors of consumption variability for food away from home are shown in Figure 4, Panel A. One concern surrounding food is that, as low-wage workers combine less-predictable, contingent hours amid rising housing costs and longer commutes in many major metropolitan areas, these workers and their families will become increasingly reliant on food away from home.⁵¹ First, re-appraising the link between income level and consumption variability shown in Figure 1, food away from home exhibits perhaps the strongest income gradient across the various dimensions of consumption variability. Returning to variability, we find a range in Figure 4 from 1.529 higher (2nd decile) to 0.062 higher (9th decile) relative to mean variability in the top decile of 1.240. This gradient suggests that, for the most vulnerable in the bottom four income deciles, consumption of food away from home is highly variable and twice as high as variability experienced by the top decile. Given the realities of low-wage work – including schedules more likely to be contingent upon demand – and limited access to high-quality transportation, food consumption outside the home is a reality for many families.

5.5 | Personal care, entertainment, gasoline and alcohol variability

We close our summary of the main results with a discussion of personal care, entertainment, gasoline and alcohol consumption variability, as shown in Panel B of Figure 4. These measures further characterise how low-income households do or do not smooth consumption. Personal care, entertainment, gasoline and alcohol are distinct from food, in that they have a higher income elasticity. For entertainment, the bottom decile exhibits higher consumption variability relative to the top decile, followed by a gradual decline in variability until variability at the 8th and 9th deciles are indistinguishable from variability at the top of the income distribution. Importantly, mean entertainment consumption (Figure 1, Panel B) rises noticeably with family income, from roughly \$230 (decile 1) to almost \$980 (decile 10).

Personal care, gasoline and alcohol represent a departure from all previous results, as consumption variability for two of these three categories is not highest for the 1st income decile. The point estimate is highest for the 2nd decile for personal care (Figure 4). The 3rd to 9th deciles show a slow decline in variability such that we still observe that personal care variability is higher for the bottom nine income deciles than the top decile.

Gasoline variability is highest in the bottom two deciles, followed by the top decile. Variability is lower in the 4th to 9th deciles, resulting in a U shape across the income deciles.

Alcohol reverses the primary results. Relative to the 10th decile, alcohol variability is lower at all deciles and lowest in the bottom decile. That said, alcohol consumption is a tiny fraction of after-tax income (see Figure 2).

6 | ALTERNATIVE INCOME MEASURES

The results presented so far use reported 12-month income to understand how consumption variability differs across the income distribution. In this section, we test the sensitivity of our results to two

⁵¹ Ziliak, 2016.

alternative measures of permanent income: education and non-durable spending. Reported income may be noisy due to measurement error in income⁵² and due to annual income volatility. Education often proxies for permanent income due to the strong correlation between education and earnings.⁵³ Because of borrowing constraints, consumption as measured by non-durable spending is often used as an explicit measure of permanent income.⁵⁴

Results using non-durable spending decile as a proxy for permanent income are shown in Figure 5. The patterns from Figure 4 remain. The income gradient remains consistent across all consumption categories, with the lowest decile displaying the highest variability for all spending categories except for personal care and alcohol. The results also hold when using education as a proxy for permanent income in Figure 6. The omitted category is those with at least a bachelor's degree. Those with the lowest education, less than a high school degree, exhibit the greatest consumption variability for all categories except alcohol. Overall, our results are consistent across our three income measures.

7 | DEMOGRAPHIC PREDICTORS OF CONSUMPTION VARIABILITY

While the focus of our inquiry sought to examine consumption variability across the income distribution, the results also lend themselves to a broader socio-economic examination of the consumption variability patterns. Specifically, we can now assess how a broader set of socio-demographics are correlated with consumption variability *after* accounting for income. We specifically discuss the role of educational attainment and family structure. These are important for several reasons. Educational attainment is widely proffered as an actionable policy intervention and tool to promote upward economic mobility, economic stability and well-being.⁵⁵ This is especially so given anti-poverty policy interventions aimed at improving labour market skills and targeted towards families with dependent children headed by a never married parent – families with a significantly higher poverty rate. Is consumption variability higher for these families, after controlling for other socio-economic and demographic characteristics?

Starting with education where those with a terminal high school degree are the omitted category, those with less than a high school degree exhibit greater consumption variability across all categories, except alcohol, than those with higher levels of education (see Table 2). Those with a college degree or higher display lower variability than those with lower education for all consumption categories except for strictly non-durables, which has a point estimate close to zero. The education gradient (which is highly correlated with income and race) could be proxying for exposure to labour market risk in an increasingly bifurcated, hollowed-out market where higher-level credentials lead to greater employment stability.⁵⁶ For example, lower-wage workers – usually with fewer formal skills – have higher variability in hours worked, reflecting lowered union bargaining power and worker protections.⁵⁷

Those who are divorced or unmarried display higher consumption variability or the same variability than those who are married, again with a fairly consistent pattern across the consumption categories. Lastly, those with one child or two children appear to exhibit less variability than those with no children, except for personal care and alcohol. Those with three children or more experience higher variability except for gasoline and alcohol. These last three results perhaps have more to do with selection into marriage and child-bearing, which has increasingly and disproportionately become the

⁵² Brummet et al., 2018; Meyer and Mittag, 2019.

⁵³ Hoynes, Page and Huff Stevens, 2006.

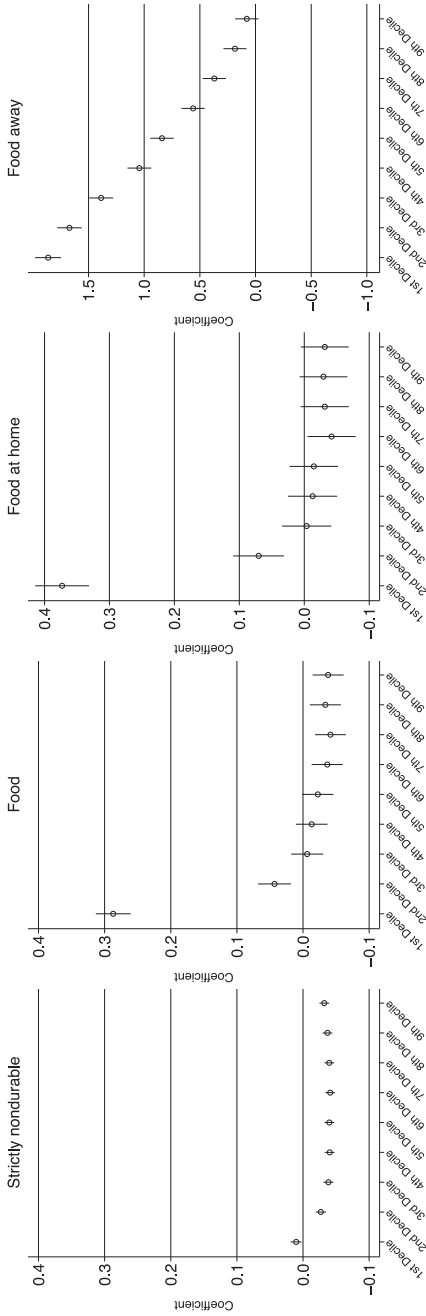
⁵⁴ Heathcote et al., 2010.

⁵⁵ Mazumder, 2005; Autor, 2014; Rothstein, 2019.

⁵⁶ Autor, 2014; Jaimovich and Siu, 2020.

⁵⁷ LaBriola and Schneider, 2020.

Panel A



Panel B

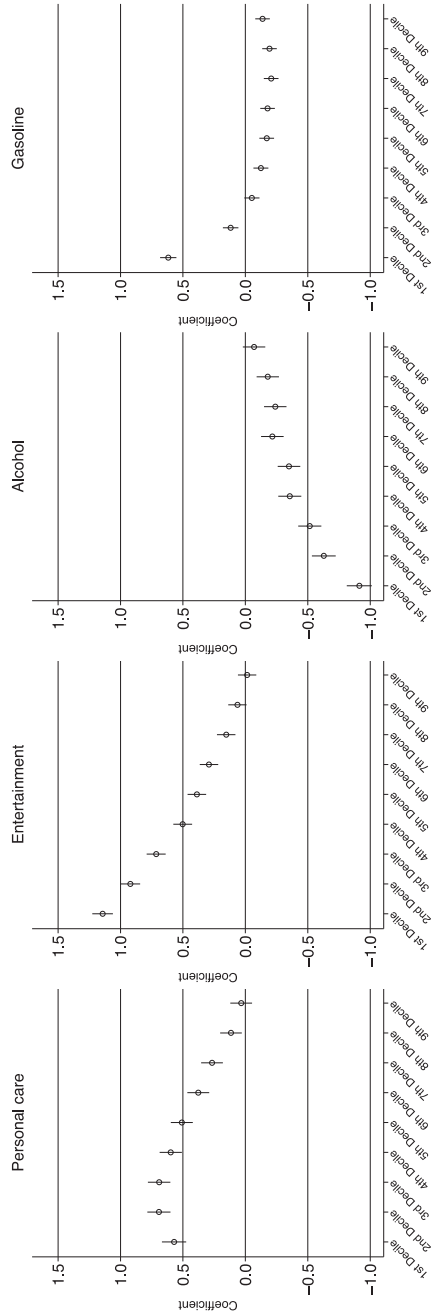
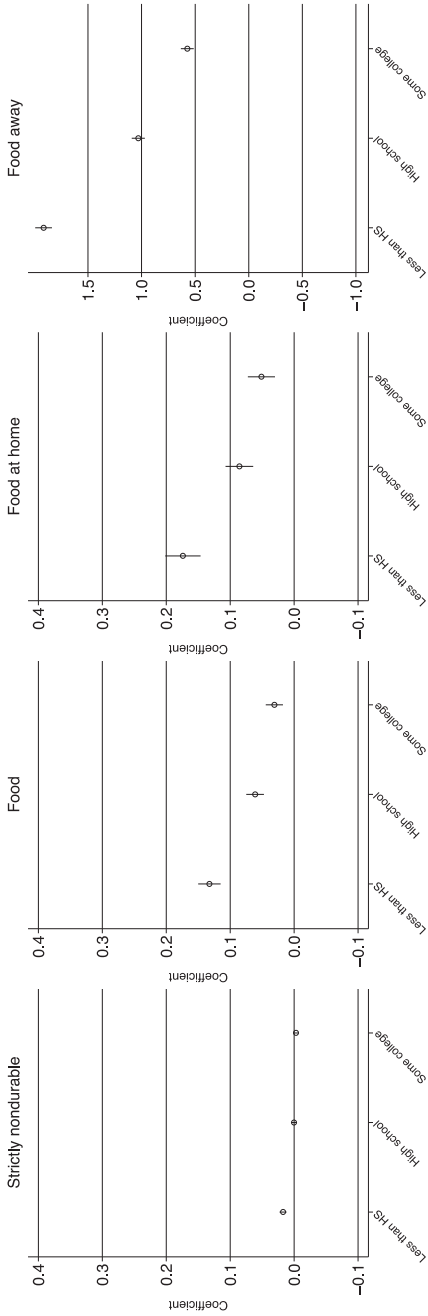


FIGURE 5 Regression-based consumption variability relative to the 10th decile of non-durable spending, by consumption category.

Note: The top decile is the omitted category. The lines represent the 95 per cent confidence interval. $N = 90,536$.

Source: Authors' calculations based on the 1984–2019 CE.

Panel A



Panel B

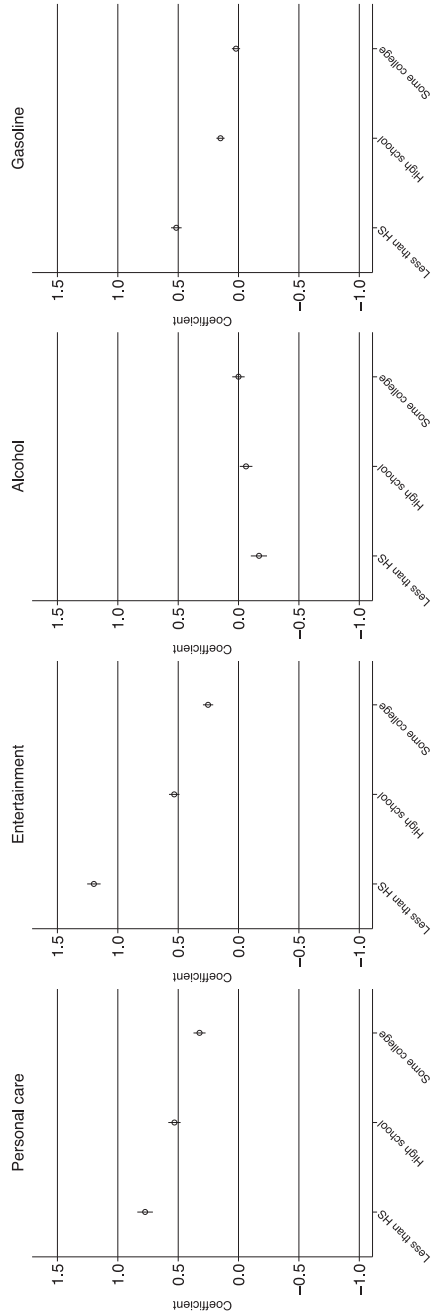


FIGURE 6 Regression-based consumption variability relative to the 10th decile of education level, by consumption category. *Note:* Those with at least a bachelor's degree are the omitted category. The lines represent the 95 per cent confidence interval. *N* = 90,536. *Source:* Authors' calculations based on the 1984–2019 CE.

TABLE 2 OLS regression results for other coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Strictly non-durable	Food	Food at home	Food away	Entertainment	Personal care	Gasoline	Alcohol
Black	0.0014 (0.0026)	0.0719*** (0.0084)	0.1050*** (0.0133)	0.7293*** (0.0373)	0.5580*** (0.0265)	0.4514*** (0.0312)	0.3898*** (0.0210)	-0.0640* (0.0322)
Other race	0.0277*** (0.0039)	0.0551*** (0.0124)	0.0674*** (0.0195)	0.7350*** (0.0549)	0.6698*** (0.0390)	0.4388*** (0.0459)	0.1935*** (0.0309)	0.1422** (0.0474)
Divorced	-0.0014 (0.0027)	0.0036 (0.0087)	0.0090 (0.0136)	0.2355*** (0.0383)	-0.0541* (0.0272)	0.1470*** (0.0320)	0.0464* (0.0216)	0.1304*** (0.0331)
Never married	0.0127*** (0.0029)	0.0187* (0.0092)	0.0623*** (0.0145)	-0.0209 (0.0408)	0.0167 (0.0290)	0.0918** (0.0341)	0.1938*** (0.0229)	0.1733*** (0.0352)
Less than high school degree	0.0146*** (0.0028)	0.0522*** (0.0091)	0.0634*** (0.0143)	0.6859*** (0.0402)	0.5503*** (0.0285)	0.1537*** (0.0336)	0.3023*** (0.0226)	-0.0342 (0.0347)
Some college	-0.0020 (0.0022)	-0.0198** (0.0071)	-0.0210 (0.0112)	-0.3184*** (0.0316)	-0.2046*** (0.0225)	-0.1344*** (0.0264)	-0.0969*** (0.0178)	0.0130 (0.0273)
College or higher	0.0001 (0.0023)	-0.0415*** (0.0074)	-0.0601*** (0.0117)	-0.6532*** (0.0328)	-0.3364*** (0.0233)	-0.3054*** (0.0274)	-0.1002*** (0.0184)	-0.0691* (0.0283)
Two adults	-0.0166*** (0.0027)	-0.0604*** (0.0085)	-0.1833*** (0.0135)	0.2967*** (0.0378)	-0.1517*** (0.0269)	0.0646* (0.0316)	-0.1881*** (0.0213)	0.1636*** (0.0326)
Three adults	-0.0165*** (0.0032)	-0.0674*** (0.0103)	-0.2072*** (0.0162)	0.7834*** (0.0455)	-0.0543 (0.0323)	0.2399*** (0.0380)	-0.2062*** (0.0256)	0.3322*** (0.0392)
One child	-0.0083*** (0.0022)	-0.0018 (0.0072)	-0.0302*** (0.0114)	-0.0671* (0.0319)	-0.0864*** (0.0227)	0.1182*** (0.0267)	-0.0080 (0.0179)	0.0375 (0.0276)
Two children	-0.0129*** (0.0023)	-0.0169* (0.0074)	-0.0393*** (0.0117)	-0.1418*** (0.0329)	-0.0690** (0.0234)	0.1591*** (0.0275)	-0.0277 (0.0185)	0.0152 (0.0284)
Three or more children	-0.0071* (0.0029)	0.0410*** (0.0092)	0.0285* (0.0144)	0.1450*** (0.0406)	0.1691*** (0.0288)	0.4128*** (0.0339)	0.1038*** (0.0228)	-0.0137 (0.0350)
Adjusted R ²	0.007	0.016	0.018	0.066	0.058	0.036	0.035	0.010
N	90,536	90,536	90,536	90,536	90,536	90,536	90,536	90,536

Note: Dependent variable is variability. Standard errors in parentheses. *p < 0.05; **p < 0.01; ***p < 0.001. Source: Authors' calculations based on the 1984–2019 CE.

domain of socio-economically advantaged adults, with higher incomes and educational credentials.⁵⁸ Like education, this result may again reflect greater exposure to economic risk, on average, among never-married family heads and those without children.

Households headed by Black individuals or by other non-White individuals have higher variability than households headed by a White individual, except for alcohol for Black individuals.⁵⁹ Importantly, this is consistent with findings from the income variability literature, which generally finds a similar socio-demographic pattern.⁶⁰ This evidence is a useful complement to work, showing that Black people, on average, have lower access to credit and lower wealth to buffer against labour market volatility.^{61,62} They are also more likely to be exposed to broader labour market risks such as hours instability associated with low-wage work.⁶³

We estimated regressions interacting income decile and race to understand if the income gradient persists across all races. We find that the variability-income gradient exists for all races (see Table A2 in the online appendix). The higher variability for Black individuals from Table 2 appears to come from throughout the income distribution. This finding suggests, as have others, that broader characterisations of well-being beyond income level are required to more fully capture economic security across race. Importantly, many ostensibly middle- and higher-income Black families lack the cushion from wealth to absorb income fluctuations and smooth consumption even for necessities.⁶⁴

8 | CONCLUSION

Using data from the 1984–2019 CE, we estimate the link between income, demographics, and the variability of strictly non-durables, food, entertainment, gasoline and alcohol consumption. We also report consumption levels across the income distribution to get a better sense for how consumption variability might matter for households with unequal income and consumption levels. Our findings provide convincing evidence that some of the most essential categories of consumption exhibit the highest variability among lower-income households – households that were already consuming at relatively low baseline levels. Specifically, the finding that food away from home is highly volatile for poor and lower-income households is particularly concerning, given that the nature of work schedules has shifted time use away from food preparation.⁶⁵ It is important to highlight that overall food variability levels that pool food at home and food away from home – while rising for households with lower levels of income – are comparatively low overall relative to categories such as personal care, entertainment and alcohol. These results are broadly consistent with similar findings by Kniesner and Ziliak (2002a), Blundell and Pistaferri (2003), Blundell et al. (2008) and Gorbachev (2011). We complement these PSID-based studies by exploiting the within-panel characteristics of the CE to examine how consumption variability relates to the income distribution.

Consumption variability among lower-income and socio-economically disadvantaged families in the US has potentially serious consequences for overall economic security. Black people are over-represented among the poor and near-poor, and higher consumption variability among Black families – after accounting for income level – as well as those with less formal educational attainment strongly

⁵⁸ Shafer and James, 2013; Hardy and Marcotte, 2020.

⁵⁹ The CE has limited information on race and ethnicity before 2003. The CE introduced the Hispanic origin question in 2003, and race was limited to White, Black, Asian or American Indian/Alaskan Native before 2003.

⁶⁰ Keys, 2008; Ziliak et al., 2011; Hardy, 2017.

⁶¹ Hamilton et al., 2015; Emmons and Ricketts, 2017; Morduch and Schneider, 2017.

⁶² Baker (2018) finds that the spending of those with higher debt or lower assets responds more to income shocks.

⁶³ LaBriola and Schneider, 2020.

⁶⁴ Pfeffer and Killewald, 2018; Darity, Addo and Smith, 2021.

⁶⁵ Ziliak, 2016.

suggests that economic insecurity is unevenly distributed across society. This is broadly consistent with evidence of racial and educational inequality in access to economic security. This has been confirmed for the incidence of income variability amid low income;⁶⁶ economic mobility using income, consumption and wealth measures;⁶⁷ and consumption responses to income shocks.⁶⁸

Food consumption variability could lead to food insufficiency and food insecurity,⁶⁹ and food insecurity related to varied consumption patterns has generally been linked to lowered health outcomes,⁷⁰ including increased hypoglycaemic episodes.⁷¹ More generally, food insecurity is associated with lowered educational performance.⁷² While the SNAP decreases consumption variability for recipients,⁷³ our results show that it is insufficient in its current form to close the gap in food variability between low- and high-income households. Future work can investigate how the monthly Advance Child Tax Credit in 2021 affected consumption variability, as one possible policy intervention that may decrease consumption variability.

The results have important implications for how we interpret a more recent stylised fact: that low-income households report baseline consumption *levels* corresponding to income-based definitions that would appear to leave many above poverty. In other words, consumption-based definitions of poverty can yield lower poverty rates than income-based definitions. Such snapshots of consumption levels in the context of poverty and economic well-being do not account for the within-year swings in consumption that are apparent within this population. This is consistent with research showing consumption variability based on income flows,⁷⁴ with important societal and economic implications. As a result, for point-in-time conceptions of well-being, it may very well be that yearly consumption variability, as estimated in the PSID, is biased downward relative to quarterly variability via the CE. Higher levels of consumption variability amid low levels of income and liquidity raise concerns about the timing of consumption, and how overall economic well-being might be affected. This is consistent with evidence of consumption spikes on and around the renewal of SNAP benefits,⁷⁵ as well as how redistributive programmes targeted towards families with lower and moderate incomes, such as the Earned Income Tax Credit, provide insurance against consumption shocks.⁷⁶ Accordingly, it will be instructive to continue to explore the concurrence of low income and both the level and variability of consumption.

Our findings suggest that low income coincides with higher levels of consumption variability. Qualitative data on family consumption patterns⁷⁷ suggest that higher-frequency data on consumption variability could yield even higher estimates among lower-income households. Given that basic necessities as well as fairly common consumption goods appear to be consumed at lower levels and with higher variability among low-income families, studies examining well-being using multiple dimensions – income and consumption – potentially enrichen our understanding of economic well-being across the economic spectrum.

⁶⁶ Hardy and Ziliak, 2014; Hardy, 2017.

⁶⁷ Fisher et al., 2018.

⁶⁸ Ganong et al., 2020.

⁶⁹ Jolliffe and Ziliak, 2008.

⁷⁰ Gundersen and Ziliak, 2015.

⁷¹ Seligman et al., 2014.

⁷² Jyoti, Frongillo and Jones, 2005; Hoynes et al., 2016.

⁷³ Blundell and Pistaferri, 2003; Gundersen and Ziliak, 2003.

⁷⁴ Hastings and Washington, 2010.

⁷⁵ Shapiro, 2005; Hastings and Washington, 2010.

⁷⁶ Kniesner and Ziliak, 2002b.

⁷⁷ Morduch and Schneider, 2017.

ACKNOWLEDGEMENTS

We thank Jim Ziliak and two anonymous referees, as well as seminar participants at the University of Virginia and Tulane University, for helpful feedback on earlier versions.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Fisher, J. & Hardy, B. L. (2023), Money matters: consumption variability across the income distribution, *Fiscal Studies*, 1–24.
<https://doi.org/10.1111/1475-5890.12339>