Has Consumption Inequality Mirrored Wealth Inequality in the Survey of Consumer Finances?

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Abstract. A method to impute consumption expenditure inequality between wealth groups in the Survey of Consumer Finances is provided, allowing for measurement error that is correlated with income and wealth. Identification is derived from observing food at home and away, which are relative necessities and luxuries, respectively. The gap in expenditure between top and bottom wealth quintiles increased by 50% between 2004 and 2013, indicating that increases in wealth inequality have passed through to consumption.

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1 Introduction

The extent to which rising income disparities have been transmitted to consumption is an important topic of research.[1] Early work concluded that consumption inequality has not increased as rapidly as income inequality. However, evidence that consumption micro data are inconsistent with aggregate data (see Parker, Vissing-Jorgensen, and Ziebarth (2009)) led to new approaches. After allowing measurement error to be correlated with income, Aguiar and Bils (2015) find that consumption inequality has closely tracked income inequality.

The relationship between rising *wealth* inequality and consumption has received less attention. One reason is the lack of micro data with good measures of both wealth and expenditure. The Panel Study of Income Dynamics (PSID) reports expenditure and net worth, but is less representative than the Survey of Consumer Finances (SCF). The SCF captures the upper tail of the wealth distribution,[2] but only measures expenditure on food. Fisher, Johnson, Smeeding *et al.* (2018) compare trends in consumption and wealth inequality in the SCF, but use an imputation approach that does not allow for systematic measurement error. Aguiar and Bils (2015) find that higher income households have a greater tendency to underreport expenditure, and the same is likely to be true of wealthier households.

This paper provides an imputation method for total expenditure inequality in the SCF, allowing for measurement error that depends on income and wealth. The measure of consumption inequality is an estimated expenditure gap, defined as the difference in mean log expenditure between households in the top and bottom wealth quintiles. The estimated gap increased by about 50% between 2004 and 2013, then fell somewhat in 2016. Estimated gaps in total expenditure in the SCF are about 2.5 times as large as observed gaps in food expenditure. If the estimates were based on non-representative PSID data, the conclusion would have been that the expenditure gap fell. We show that a similar conclusion to that in the PSID would be attained in the SCF if only the bottom 95% of the wealth distribution were used. Thus, it is important to both use representative wealth data, and account for systematic measurement error.

2 Methodology

Let x_{hjt} be observed expenditure by household h, on good j, in year t. Total expenditure in a year is $X_{ht} = \sum_j x_{hjt}$. Observed expenditure differs from true expenditure, x^*_{hjt}, due to measurement error, ζ_{hjt}, according to $x_{hjt} = x^*_{hjt} e^{\zeta_{hjt}}$. Measurement error has four components: (1) good-specific error ψ^j_t, (2) income-specific error ϕ^i_t, where i denotes income quintile, (3) wealth-specific error ϕ^w_t, where w denotes wealth quintile, (4) general error ν_{hjt}. The first three components are systematic, while the fourth is assumed to be classical random error.

[1] See Blundell, Pistaferri, and Preston (2008), Krueger and Perri (2006), Heathcote, Perri, and Violante (2010), Attanasio and Pistaferri (2014),Aguiar and Bils (2015), and Meyer and Sullivan (2017).

[2] The SCF oversamples wealthy households, thus sample weights must be used in analysis.

The measurement error components are additive, such that $\zeta_{hjt} = \psi_t^j + \phi_t^i + \phi_t^w + \nu_{hjt}$.

The first step is the same as in Aguiar and Bils (2015), and additional details can be found there. This step involves estimating log-linear Engel curve approximations. Specifically, for each expenditure category the following demand approximation is estimated:

$$\ln x_{hjt}^* - \ln \overline{x}_{jt}^* = \alpha_{jt}^* + \beta_j \ln X_{ht}^* + \mathbf{\Gamma}_j \mathbf{Z}_{ht} + \varphi_{hjt}. \tag{1}$$

$\overline{x}_{jt}^*$ is cross-sectional average spending on a particular good, $\mathbf{Z}_{ht}$ is a set of demographic control variables, and φ_{hjt} is an error term. Any changes in demand or prices over time are captured by the good-time intercept terms α_{jt}^*. The coefficients of interest from equation 1 are the expenditure elasticities, β_j, for each good j. Aguiar and Bils assume these elasticities are stable over time.

Several issues arise in estimating equation 1, the most important of which is that when $\ln x_{hjt}^*$ is replaced by observed $\ln x_{hjt}$, measurement error that is correlated with $\ln X_{ht}$ is added to the error term. Income quintile and log after-tax income are used as instruments, allowing for consistent estimation of the β_j coefficients. A second issue is that x_{hjt} can be zero if a household does not purchase a particular good. To keep the right-hand side finite in these cases, the log-differences in 1 are replaced by percentage deviations $\tilde{x}_{hjt} = \frac{x_{hjt} - \overline{x}_{jt}}{\overline{x}_{jt}}$.

In the second step, the β_j estimates from step one are taken as given and the demand system is inverted. Firstly, a left-hand-side variable is constructed as $\hat{x}_{hjt} = \tilde{x}_{hjt} - \mathbf{\Gamma}_j \mathbf{Z}_{ht}$. Secondly, a new regression equation is formed by adding and subtracting $\ln X_{it}^*$ in the right-hand side of 1, where $\ln X_{it}^*$ is average log expenditure of income quintile i. The resulting regression equation is

$$\hat{x}_{hjt} = \alpha_{jt}^* + \phi_t^i + \phi_t^w + \beta_j \ln X_{it}^* + \epsilon_{hjt}, \tag{2}$$

where $\epsilon_{hjt} = \beta_j(\ln X_{ht}^* - \ln X_{it}^*) + \nu_{hjt} + \varphi_{hjt}$. $\ln X_{it}^*$ is estimated by including β_j as a regressor, interacted with dummies for income quintile and year.[3] In the current paper, versions with expenditure by wealth quintile, $\ln X_{wt}^*$, in place of income quintile, are also be estimated. Good, income-quintile, and wealth-quintile dummy variables, all interacted with year dummies, are included in order to capture α_{jt}^*, ϕ_t^i and ϕ_t^w, respectively.

Identification of $\ln X_{it}^*$ or $\ln X_{wt}^*$ in the second step requires variation across goods in the total expenditure elasticities, i.e. β_j. Given estimates of these elasticities, the regression in equation 2 could be run on a different data set than the one used to produce the elasticity estimates. One requirement for the alternative data is that expenditure measures on a subset of the categories in the original data are observed, and there is variation in

[3]See footnote 16 of Aguiar and Bils for proof that ϵ_{hjt} is orthogonal to the regressor.

the total expenditure elasticities across these goods. The strategy for measuring consumption inequality in the SCF data is to run regressions based on equation 2, using the difference in elasticities between food at home and away from home to identify differences in expenditure between wealth and/or income groups.

3 Data

The sample periods are 2005-2017 for the PSID (SRC sample) and 2004-2016 for the SCF (full sample). The two data sets have similar information on net worth, income, demographic variables, and measures of food expenditure. The PSID also has many additional measures of expenditure. The first step requires after-tax income, which we calculate using the NBER's TAXSIM program. We confirm that measures of food expenditure are similar between the two data sets. Because delivered food is zero for more than 3/4 of observations, we use at home, away from home, and total food as the three measures of food expenditure.

4 Results

4.1 Step One: Estimate β_j's

The first step estimates the total expenditure elasticities in equation 1 using PSID data. Column (I) of Table 1 reports selected elasticities estimated in the baseline specification using income quintile dummies and log after-tax income as instruments. Column (II) shows that these estimates are robust to also using wealth quintile dummies as instruments. Column (III) reproduces corresponding estimates from Aguiar and Bils (2015) to assess comparability. The most pertinent elasticities are those for food at home and away from home, which are 0.51 and 1.10, respectively. This indicates that food away is a relative luxury and food at home is a relative necessity, as our imputation approach requires. Estimates are robust to the additional instrument, and are comparable to those in Aguiar and Bils.

4.2 Step Two: Estimate $\ln X^*_{it}$ and $\ln X^*_{wt}$

PSID Estimates: Table 2 reports estimated trends in consumption inequality by both income and wealth. The table specifically reports the differences in log consumption between the fifth and first quintiles of income or wealth. The notation $\ln X^*_{5(g),t}$ refers to the consumption difference between the fifth and first quintile of variable g at time t. The first two columns report estimates using all spending categories, while the third and fourth columns report estimates based on food expenditure only. Overall, inequality between income/wealth quintiles

Category	(I) β_j	(I) s.e.	(II) β_j	(II) s.e.	(III) β_j	(III) s.e.
Food at Home	0.51	(0.02)	0.52	(0.01)	0.37	(0.02)
Food Away from Home	1.10	(0.03)	1.05	(0.03)	1.33	(0.06)
Food Delivered	1.01	(0.13)	0.96	(0.12)	–	–
Food Total	0.68	(0.01)	0.65	(0.02)	–	–
Housing	1.10	(0.03)	1.00	(0.03)	0.92	(0.02)
Transportation	0.77	(0.03)	0.76	(0.02)	0.89	(0.03)
Clothing	1.77	(0.13)	1.45	(0.11)	1.35	(0.05)
Furnishings	1.90	(0.15)	1.60	(0.13)	1.39	(0.10)
Education	1.56	(0.10)	0.97	(0.10)	1.63	(0.18)
Childcare	1.41	(0.11)	1.54	(0.10)	1.6	(0.13)
Health Care	1.07	(0.04)	0.91	(0.04)	0.91	(0.06)
Recreation	1.74	(0.10)	1.53	(0.08)	1.74	(0.06)

Table 1: Selected total expenditure elasticities. (I) uses income quintile and log after-tax income as instruments. (II) includes wealth quintile as an additional instrument. (III) reproduces estimates from Table 2 of Aguiar and Bils.

PSID Results	(I)		(II)		(III)		(IV)	
Group Variable (g)	Income		Wealth		Income		Wealth	
Elasticities Used	All		All		Food		Food	
$\ln X^*_{5(g),2005}$	1.417	(0.159)	0.832	(0.148)	1.238	(0.200)	0.688	(0.213)
$\ln X^*_{5(g),2007}$	1.160	(0.133)	0.810	(0.129)	1.194	(0.193)	0.666	(0.168)
$\ln X^*_{5(g),2009}$	1.149	(0.152)	0.695	(0.163)	1.173	(0.175)	0.618	(0.189)
$\ln X^*_{5(g),2011}$	1.256	(0.137)	0.891	(0.155)	1.294	(0.142)	0.688	(0.187)
$\ln X^*_{5(g),2013}$	1.050	(0.120)	0.597	(0.137)	1.392	(0.151)	0.711	(0.186)
$\ln X^*_{5(g),2015}$	1.016	(0.137)	0.738	(0.157)	1.273	(0.172)	0.616	(0.199)
$\ln X^*_{5(g),2017}$	0.956	(0.133)	0.641	(0.149)	1.257	(0.198)	0.720	(0.193)

Table 2: PSID Results: Each coefficient is an estimate of the difference in log expenditure between the fifth and first quintile of variable g. Bootstrapped standard errors that adjust for the first stage are in parentheses.

is estimated to have fallen; however, the initial level of inequality is very high. The estimates of $\ln X^*_{5,2005}$ and $\ln X^*_{5,2007}$ for income are similar to the estimate for the 2005-07 period reported by Aguiar and Bils (2015). Aguiar and Bils report a decline in consumption inequality from that period to the 2008-2010 period, consistent with the persistent decline we estimate from 2005 to 2017. For expenditure inequality between wealth groups, we find that $\ln X^*_{5,t}$ is relatively stable over time, with perhaps a slight decline that is not statistically significant. Comparing estimates using all expenditure categories, versus food only, we observe differences in the point estimates, but these are small relative to the standard errors. Thus, we conclude that using food expenditure measures alone does not change the conclusions of step two compared to using all expenditure measures.

SCF Estimates: Columns I and II of Table 3 report estimated trends in consumption inequality between income and wealth groups in the SCF. For both wealth and income, the estimated difference in consumption

SCF Results	(I)		(II)		(III)		(IV)	
Group Variable (g)	Income		Wealth		Income		Wealth	
Sub-sample Used	Full Sample		Full Sample		Bottom 95%		Bottom 95%	
$\ln X^*_{5(g),2004}$	1.529	(0.045)	1.200	(0.045)	1.207	(0.044)	0.689	(0.056)
$\ln X^*_{5(g),2007}$	1.857	(0.060)	1.489	(0.058)	1.358	(0.055)	0.847	(0.049)
$\ln X^*_{5(g),2010}$	1.952	(0.046)	1.436	(0.052)	1.365	(0.044)	0.716	(0.042)
$\ln X^*_{5(g),2013}$	2.050	(0.039)	1.706	(0.039)	1.481	(0.047)	0.999	(0.046)
$\ln X^*_{5(g),2016}$	1.827	(0.043)	1.477	(0.047)	1.423	(0.033)	0.887	(0.047)

Table 3: SCF Results: Each coefficient is an estimate of the difference in log expenditure between the fifth and first quintile of the variable g. Bootstrapped standard errors that adjust for the first stage are in parentheses.

between the top and bottom quintiles rises substantially from 2004 to 2013, and then falls somewhat in the final sample period 2016. To provide more context, the implied shares of total expenditure among the wealthiest 20% were computed. From 2004 to 2016 the share of consumption attributed to the wealthiest 20% increased from 39.9% to 46.4%. Meanwhile, their share of wealth increased from 82.9% to 88.3%. Thus, the shares of total wealth and total consumption attributed to the wealthiest 20% of households increased by similar percentages.

The degree of consumption inequality between top and bottom quintiles of both wealth and income is much higher in the SCF than PSID. Based on the SCF, we conclude that recent increases in wealth and income inequality have led to substantially larger disparities in the standard of living across the population. However, we must understand why the SCF results are so different to be comfortable making such a conclusion. As it turns out, the differences between the SCF and PSID results are explained by the superior measurement of the top of the wealth distribution in the SCF. The literature indicates that the PSID captures the bottom 95% of the wealth distribution well, but fails at the very top (Pfeffer, Schoeni, Kennickell *et al.*, 2016; Bosworth and Smart, 2009). Thus, we re-estimate the $\ln X^*_{5(g)t}$ coefficients excluding households in the top 5% of the SCF wealth distribution. In this case, the magnitude of the estimates is very similar to the PSID, confirming the importance of using data that captures the top of the wealth distribution.

5 Conclusion

We find that expenditure differences between households at the top and bottom of the wealth distribution are large and have increased over time. In 2013 the consumption gap was 50% larger than in 2004. Consumption gaps between top and bottom income groups are also large and increased over the sample period. Capturing those in the upper tail of the wealth distribution is very important for this finding: excluding the wealthiest 5% of households, or relying on the PSID, would lead to a different conclusion.

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