

Web Appendix to: “Did Household Consumption Become More Volatile?”

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I show that after accounting for predictable variation arising from movements in real interest rates, preferences and income shocks, liquidity constraints and measurement errors, volatility of household consumption in the US increased by 25 percent between 1970 and 2004. The increase was lower than that of volatility of family income. Nonwhite and those with less than 13 years of education, for whom there was no differential increase in income volatility, experienced significantly larger increase in volatility of household consumption. Substantial differences in wealth and access to credit markets point to the main reason for this divide.

(JEL: D80, D91, E21)

Keywords: panel data, Euler estimation, consumption risk, racial divide

I. Data Sample: Panel Study of Income Dynamics

The Panel Study of Income Dynamics (PSID), which began in 1968, is a longitudinal study of a representative sample of U.S. individuals (men, women, and children) and the family units in which they reside, and is conducted by the University of Michigan. The PSID’s sample size has grown from 4,800 families in 1968 to more than 7,000 families (and over 60,000 individuals) in 2001. Some families are followed for as much as 36 consecutive years.

Consumption data in PSID are limited to food and shelter. I compute all the consumption volatility measures on food consumption calculated as a sum of food consumed at home plus away from home plus food stamps received. The core sample contains data from 1968 to 2005, and consists of heads of households (both female and male) who are not students and are not retired. I keep households whose head is at least 25 years old but less than 65. I drop all the households that belonged to the Latino or Immigrant samples, and those that were drawn from the Survey of Economic Opportunity (SEO). Households that report negative or zero total food consumption levels are also eliminated. In order to minimize effects of outliers on the results, I follow the literature by dropping households who report more than 500 percent change in family income or food consumption over a one year period as well as those whose income or consumption fall by more than 95 percent (see for example Stephen Zeldes (1989) or Richard Blundell, Luigi Pistaferri and Ian Preston (2008)).

The most important issue to note regarding the data is that it became biennial after 1997. Thus, I compute all my results on annual data before 1997. I then construct a hypothetical biennial sample to study the evolution of consumption volatility up to 2004. Since income and consumption data is collected for previous year, the biennial sample has data for *even* years from 1976 to 2004. In addition, food consumption data was not collected in 1973, 1988 and 1989. I do not impute for the missing years in order to keep measurement error and misidentification to a minimum.

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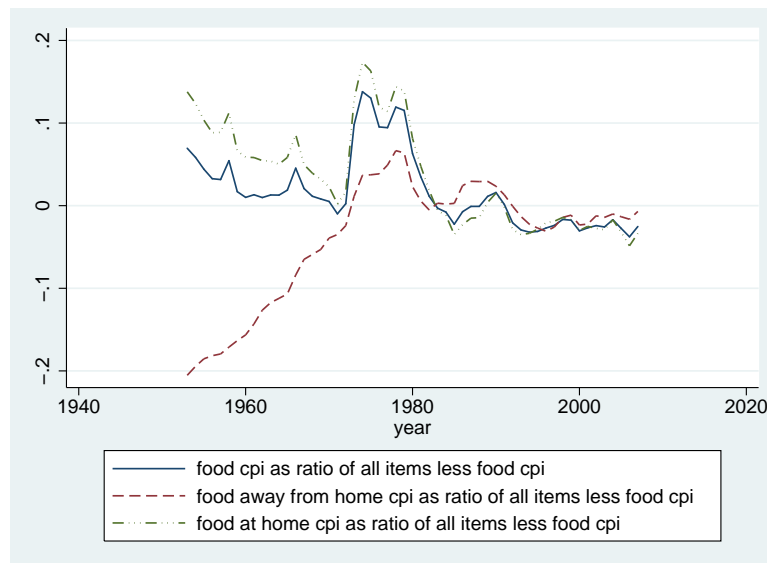
At the time of the interview, the respondent is asked questions about income, transfers, wealth and expenditures on food and shelter. The families are asked to report income and transfers received during the previous year. I use total family income to compute income uncertainty. I adjust income data by one period to correspond to the appropriate demographic characteristics for each household. The timing of consumption data is more ambiguous. I follow Blundell, Pistaferri and Preston (2008), among many others, and assume that the respondent provided information on food expenditures for the previous year. I use an annual average of monthly data on 1-year constant maturity Treasury bills.

All the income, expenditure, wealth, and interest rate data are expressed in real terms. Nominal data are converted into real using item specific regional not seasonally adjusted all urban Consumers Consumer Price Index (CPI-U) with base period of 1982-1984=100. Thus, food expenditures are deflated using the Food and Beverages CPI; housing expenditures, using the Housing CPI; and all income, wealth and interest rate series, using All-Items CPI.

We separate our sample into liquidity constrained and unconstrained households using information from Wealth Supplements. Wealth information was collected in 1984, 1989, 1994, 1999 and biennially after that. Household is counted as liquidity unconstrained if they had positive non-housing net wealth. For the years when wealth data is unavailable, I estimate the probit regression, probability of having positive net non-housing wealth, as a function of explanatory variables.

II. Supplementary Figures

FIGURE 1. THE RATIO OF FOOD PRICES TO THE PRICE OF ALL OTHER GOODS, (1982-1984=100)



Source: Bureau of Labor Statistics.

III. Supplementary Tables

A1. Summary Statistics, households with positive net non housing wealth, or liquidity unconstrained households

	1970		1980		1990		2000		2004	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age	41.93	11.35	38.36	10.45	39.20	8.79	42.57	9.72	43.06	10.77
number of adults	2.08	0.71	1.96	0.67	1.94	0.64	1.98	0.71	1.94	0.67
number of kids	1.47	1.46	1.17	1.19	1.10	1.17	0.92	1.11	0.86	1.07
female	0.13	0.33	0.14	0.34	0.14	0.35	0.16	0.36	0.17	0.37
nonwhite	0.10	0.30	0.09	0.29	0.09	0.29	0.10	0.30	0.10	0.30
married	0.81	0.39	0.77	0.42	0.75	0.43	0.72	0.45	0.72	0.45
single parent	0.04	0.19	0.05	0.22	0.05	0.21	0.05	0.22	0.06	0.23
real family income	\$32,194	18,612	\$34,934	29,689	\$39,621	32,772	\$49,504	54,999	\$50,183	83,350
real labour income, head	\$21,353	14,871	\$22,578	16,089	\$24,824	24,007	\$29,364	37,439	\$29,429	50,584
real labour income, wife	\$3,584	6,113	\$5,240	7,626	\$8,051	10,871	\$10,075	18,377	\$10,402	14,850
total real food expenditure	\$4,945	2,401	\$4,351	2,178	\$4,059	2,239	\$4,141	2,239	\$4,136	2,396
real food expenditure, home			\$3,404	1,851	\$3,087	1,946	\$2,833	1,635	\$2,780	1,687
real food expenditure, away from home			\$900	1,034	\$943	915	\$1,277	1,224	\$1,304	1,434
real home value	\$14,536	13,819	\$45,071	48,002	\$78,713	103,848	\$133,332	178,776	\$195,349	260,407
real net non housing wealth			\$83,487	442,372	\$94,317	306,501	\$120,599	652,103	\$136,203	647,551
real net wealth including housing			\$116,819	455,379	\$128,413	333,071	\$161,730	688,252	\$193,296	696,897
home owner	0.72	0.45	0.71	0.45	0.70	0.46	0.76	0.43	0.76	0.43
annual hours worked, head	2,214	717	2,153	699	2,246	647	2,140	628	2,178	758
annual hours worked, wife	531	782	727	859	988	957	1,009	975	1,040	1,020
unemployed	0.01	0.12	0.03	0.16	0.02	0.16	0.03	0.17	0.03	0.16
on welfare	0.03	0.17	0.04	0.20	0.02	0.14	0.02	0.13	0.04	0.18
observations	1415		2101		2361		2863		2948	

Note: Wealth information is for 1983, 1993, 2000, 2004. Price data for food at home and away from home is available starting 1978.

A2: Summary statistics: real family income vs. real food expenditure by quintile for the liquidity unconstrained.

	y≤20	20>y≥40	40>y≥60	60>y≥80	y>80	y≤20	20>y≥40	40>y≥60	60>y≥80	y>80
	Real Family Income					Real Food Expenditure				
1970	12,319	22,026	29,460	37,804	59,396	3,300	4,247	4,804	5,474	6,904
	(3,982)	(2,357)	(2,133)	(2,834)	(20,496)	(1,768)	(1,636)	(2,013)	(2,152)	(2,654)
1980	12,285	22,197	30,460	40,006	69,904	2,803	3,742	4,427	4,857	5,970
	(4,076)	(2,388)	(2,320)	(3,535)	(49,350)	(1,631)	(1,654)	(1,833)	(1,961)	(2,356)
1990	12,601	23,840	33,674	45,594	82,451	2,683	3,477	3,896	4,729	5,512
	(4,576)	(2,910)	(3,039)	(3,823)	(49,355)	(1,518)	(1,595)	(1,584)	(2,712)	(2,360)
2000	11,846	24,131	35,469	49,972	109,082	2,898	3,320	3,891	4,475	5,593
	(5,031)	(3,077)	(3,516)	(5,382)	(88,471)	(1,993)	(1,764)	(1,749)	(1,861)	(2,564)
2004	11,504	23,756	35,408	49,434	111,973	2,698	3,505	3,856	4,404	5,629
	(4,500)	(3,433)	(3,434)	(5,031)	(155,326)	(1,597)	(1,784)	(1,743)	(2,327)	(2,929)
	Real Net Non Housing Wealth					Real Net Wealth including Housing				
1983	25,533	26,080	46,917	100,559	217,450	37,739	43,863	75,160	138,271	287,880
	(89,388)	(54,734)	(256,992)	(612,163)	(706,571)	(96,025)	(66,456)	(268,761)	(617,496)	(724,826)
1993	61,497	43,317	42,421	82,208	241,619	77,035	65,613	68,669	120,679	309,215
	(334,796)	(207,569)	(76,895)	(148,147)	(509,582)	(346,775)	(243,601)	(100,715)	(159,233)	(545,802)
2000	37,434	43,993	60,791	88,479	324,234	52,706	65,304	89,308	129,941	410,559
	(148,632)	(113,414)	(161,677)	(363,260)	(1,271,468)	(154,977)	(129,980)	(178,839)	(381,668)	(1,332,628)
2004	28,492	64,597	81,760	102,169	345,840	44,574	90,787	119,872	155,885	475,433
	(95,680)	(303,799)	(243,655)	(270,951)	(1,239,187)	(112,169)	(314,627)	(269,987)	(290,241)	(1,319,365)
	SHARE OF NONWHITE WITHIN NONWHITE IN QUINTILE					SHARE WITH EDU<13 WITHIN QUINTILE				
1970	0.31	0.21	0.21	0.09	0.17	0.95	0.83	0.76	0.63	0.54
1980	0.26	0.29	0.16	0.18	0.11	0.75	0.62	0.51	0.47	0.31
1990	0.33	0.30	0.19	0.09	0.10	0.70	0.56	0.48	0.31	0.18
2000	0.25	0.25	0.18	0.21	0.11	0.63	0.58	0.50	0.32	0.17
2004	0.26	0.20	0.16	0.25	0.14	0.62	0.57	0.48	0.34	0.15

Note: Quintiles are computed on real family income for each available year of data, and includes negative or zero values.

A3. Euler Equation Estimation: OLS vs. LSDV

VARIABLES	OLS				LSDV			
	all		unconstrained		all		unconstrained	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)
Age squared	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
change in number of adults	0.124*** (0.006)	0.124*** (0.006)	0.127*** (0.006)	0.127*** (0.006)	0.121*** (0.006)	0.121*** (0.006)	0.123*** (0.007)	0.123*** (0.007)
change in number of kids	0.105*** (0.005)	0.105*** (0.005)	0.104*** (0.005)	0.104*** (0.005)	0.104*** (0.006)	0.104*** (0.006)	0.104*** (0.006)	0.104*** (0.006)
change in marital status	-0.033*** (0.006)	-0.033*** (0.006)	-0.035*** (0.006)	-0.035*** (0.006)	-0.035*** (0.007)	-0.035*** (0.007)	-0.034*** (0.007)	-0.034*** (0.007)
change in num hours worked, head	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003** (0.001)	0.003** (0.001)	0.003*** (0.001)	0.003*** (0.001)
change in num hours worked, wife	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.016*** (0.004)	0.015*** (0.005)	0.015*** (0.005)	0.014*** (0.005)	0.014*** (0.005)
income volatility	-0.006 (0.005)	-0.006 (0.005)	-0.005 (0.006)	-0.005 (0.006)	0.004 (0.007)	0.004 (0.007)	0.006 (0.007)	0.005 (0.007)
change in real house value	0.026*** (0.006)	0.026*** (0.006)	0.021*** (0.006)	0.021*** (0.006)	0.026*** (0.006)	0.026*** (0.006)	0.021*** (0.006)	0.021*** (0.006)
change in rentalship	0.050** (0.020)	0.050** (0.020)	0.055*** (0.021)	0.055*** (0.021)	0.044** (0.022)	0.044** (0.022)	0.048** (0.024)	0.048** (0.024)
change in ownership	0.056 (0.075)	0.055 (0.075)	0.123 (0.079)	0.122 (0.079)	0.047 (0.084)	0.048 (0.084)	0.159* (0.089)	0.160* (0.089)
change in real rent	0.032*** (0.006)	0.032*** (0.006)	0.034*** (0.007)	0.034*** (0.007)	0.033*** (0.007)	0.033*** (0.007)	0.039*** (0.008)	0.039*** (0.008)
ln(real interest rate, h)	0.112** (0.053)	0.021 (0.065)	0.130** (0.059)	0.053 (0.071)	0.112 (0.072)	0.136* (0.081)	0.129 (0.079)	0.152* (0.088)
price differential		0.011*** (0.004)		0.010** (0.004)		-0.018 (0.019)		-0.017 (0.020)
estimated Pr(wealth>0)			0.046** (0.021)	0.051** (0.021)			0.020 (0.039)	0.021 (0.039)
Constant	0.018	-0.026	-0.014	-0.054	0.025	0.073	-0.037	0.009
Observations	42973	42973	37730	37730	42973	42973	37730	37730
R-squared	0.051	0.051	0.053	0.053	0.121	0.121	0.134	0.134
Number of pid	5320	5320	4936	4936	5320	5320	4936	4936

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A4: Euler Equation Estimation: Arellano-Bond (AB) GMM

VARIABLES	all		unconstrained			
	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.001 (0.009)	-0.008 (0.010)	0.001 (0.009)	0.011 (0.009)	-0.006 (0.010)	0.003 (0.011)
Age squared	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
change in number of adults	0.091*** (0.029)	0.089*** (0.029)	0.089*** (0.031)	0.102*** (0.032)	0.089*** (0.031)	0.095*** (0.032)
change in number of kids	-0.024 (0.077)	0.006 (0.074)	-0.019 (0.079)	0.028 (0.080)	0.001 (0.075)	0.018 (0.075)
change in marital status	-0.074*** (0.027)	-0.069*** (0.026)	-0.067** (0.027)	-0.056** (0.027)	-0.065** (0.027)	-0.060** (0.027)
change in num hours worked, head	-0.002 (0.005)	-0.002 (0.004)	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)
change in num hours worked, wife	0.059*** (0.016)	0.058*** (0.016)	0.046*** (0.018)	0.045** (0.018)	0.043** (0.018)	0.043** (0.018)
income volatility	0.059 (0.062)	0.086 (0.062)	0.046 (0.064)	0.020 (0.065)	0.068 (0.063)	0.081 (0.071)
change in real house value	0.048* (0.029)	0.055** (0.027)	0.050 (0.033)	0.048 (0.032)	0.052* (0.031)	0.051 (0.031)
change in rental status	0.011 (0.058)	0.006 (0.058)	-0.013 (0.064)	-0.009 (0.066)	-0.014 (0.065)	-0.024 (0.064)
change in ownership	0.458 (0.337)	0.460 (0.296)	0.520 (0.397)	0.588 (0.412)	0.600* (0.353)	0.493 (0.350)
change in real rent	0.115*** (0.041)	0.124*** (0.042)	0.124** (0.053)	0.134** (0.060)	0.137** (0.053)	0.122** (0.055)
ln(real interest rate, h)	1.778 (1.256)	1.353 (0.837)	1.250 (1.222)	1.735* (1.034)	1.323* (0.789)	1.178 (0.748)
price differential		0.131 (0.094)			0.134 (0.093)	0.161 (0.132)
estimated Pr(wealth>0)				-0.116 (0.333)		0.285 (0.304)
Observations	33965	33965	29931	29491	29931	29491
R-squared						
Number of pid	4695	4695	4363	4255	4363	4255
Arrelano-Bond test for AR(1)	-33.11	-33.50	-32.68	-31.63	-32.87	-31.06
Pr>z	0	0.195	0.259	0.363	0	0
Arrelano-Bond test for AR(2)	12.61	12.70	12.41	11.19	12.42	11.15
Pr>z	0	0	0	0	0.270	0.345
Arrelano-Bond test for AR(3)	-1.301	-1.297	-1.128	-0.911	-1.103	-0.943
Pr>z	0.193	0	0	0	0	0
Sargan test of overid	20.79	18.14	19.09	21.89	16.82	20.33
df	13	14	13	14	14	15
Prob>chi2	0.0772	0.200	0.120	0.364	0.693	0.544
Hansen test of overid	13.63	11.97	12.74	15.21	10.92	13.76
df	13	14	13	14	14	15
Prob>chi2	0.401	0.609	0.468	0.0809	0.266	0.160
Number of Instruments	32	34	32	34	34	36
F-stat	6.069	6.202	4.507	4.194	4.586	4.096
Prob>F	0	0	2.56e-10	1.10e-09	5.05e-11	1.01e-09
Avg num obs	7.234	7.234	6.860	6.931	6.860	6.931
max num obs	19	19	19	19	19	19

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A5: Volatility of real family income and real food expenditure, biennial samples

VARIABLES	food (1)	income (2)	food (3)	income (4)	food (5)	income (6)	food (7)	income (8)	food (9)	income (10)
year/1000	0.898*** (0.161)	3.323*** (0.250)	0.945*** (0.159)	3.329*** (0.243)	0.567** (0.272)	4.001*** (0.429)	0.605*** (0.224)	4.080*** (0.347)	2.050*** (0.344)	2.460*** (0.359)
nonwhite * year/1000	0.719 (0.605)	1.211 (0.802)								
single parent * year/1000			0.177 (0.842)	2.614** (1.154)						
continuously married * year/1000					0.354 (0.331)	-1.261** (0.509)				
years of education<13 * year/1000							0.945*** (0.322)	-1.003** (0.480)		
1st income quintile * year/1000									-1.531** (0.666)	8.554*** (1.299)
2nd income quintile * year/1000									-0.953* (0.517)	1.181* (0.624)
4th income quintile * year/1000									-1.076** (0.449)	-0.906* (0.478)
5th income quintile * year/1000									-0.734 (0.454)	0.900 (0.551)
nonwhite	-1.391 (1.203)	-2.383 (1.591)								
single parent			-0.321 (1.674)	-5.144** (2.290)						
continuously married					-0.756 (0.657)	2.446** (1.011)				
years of education<13							-1.871*** (0.639)	2.015** (0.952)		
1st income quintile									3.131** (1.323)	-16.732*** (2.577)
2nd income quintile									1.912* (1.026)	-2.310* (1.237)
4th income quintile									2.130** (0.891)	1.793* (0.949)
5th income quintile									1.451 (0.901)	-1.742 (1.094)
change in quintile									0.009*** (0.002)	-0.018*** (0.005)
Constant	-1.654*** (0.320)	-6.435*** (0.497)	-1.744*** (0.315)	-6.447*** (0.482)	-0.961* (0.541)	-7.745*** (0.851)	-1.070** (0.445)	-7.949*** (0.690)	-3.952*** (0.682)	-4.773*** (0.713)
Observations	39365	39365	39425	39425	39425	39425	39163	39163	37787	37787
R-squared	0.002	0.006	0.001	0.007	0.009	0.011	0.001	0.007	0.013	0.059

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A6: Black-White Divide

	1983		1993		2000		2004	
	white	nonwhite	white	nonwhite	white	nonwhite	white	nonwhite
Nonhousing wealth less than 2 months of family income	0.17 (0.38)	0.40 (0.49)	0.15 (0.36)	0.30 (0.46)	0.20 (0.40)	0.33 (0.47)	0.19 (0.39)	0.30 (0.46)
Real family income	\$36,715 (27,034)	\$26,342 (16,261)	\$44,088 (46,967)	\$29,993 (38,640)	\$51,513 (56,987)	\$33,091 (28,719)	\$52,294 (87,842)	\$34,520 (27,793)
Real nonhousing net wealth	\$89,305 (461,325)	\$19,312 (46,061)	\$99,087 (317,085)	\$34,838 (76,817)	\$129,727 (686,513)	\$40,359 (114,193)	\$145,185 (675,682)	\$62,950 (339,143)
Real net wealth, including housing	\$123,872 (474,430)	\$38,834 (73,288)	\$134,814 (344,264)	\$52,999 (100,867)	\$173,283 (724,021)	\$60,524 (134,658)	\$206,313 (727,563)	\$86,360 (348,761)

Standard deviation in parentheses

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